35. Cumulative Impacts

35.1 Introduction

Cumulative impacts are impacts on the environment that result from the incremental impacts of a proposed action when added to other past, present, and reasonably foreseeable future actions (CEQA Guidelines section 15355[b], 40 CFR 1508.7). Such impacts can result from individually minor but collectively significant actions taking place over time. This chapter presents the methodology used to evaluate cumulative effects, lists related projects and describes their relationship to the proposed Project, identifies cumulative impacts by resource area, and recommends measures to mitigate significant cumulative effects. The cumulative impact analysis uses both quantitative tools (i.e. hydrologic modeling) and qualitative assessments to determine the potential combined impacts of the proposed Project and other related projects.

35.1.1 Regulatory Setting

The California Code of Regulations' Guidelines for the Implementation of the California Environmental Quality Act (CEQA Guidelines) and federal National Environmental Policy Act (NEPA) regulations require that the cumulative impacts of a proposed project be addressed in an Environmental Impact Report/Environmental Impact Statement (EIR/EIS).

35.1.2 CEQA Requirements

Under CEQA, an EIR is required to discuss the cumulative impacts of a project when the project's incremental effect is cumulatively considerable (CEQA Guidelines section 15130(a)(1)). "Cumulatively considerable" means that the incremental effects of a project are significant when viewed in connection with the effects of past projects, other current projects, and probable future projects (CEQA Guidelines section 15065(a)(3); Public Resources Code section 21083(b)(2)). Cumulative impacts are further defined in the CEQA Guidelines as two or more individual impacts that, even if individually minor, when considered together, are considerable or that compound or increase other environmental impacts (see CEQA Guidelines section 15355).

Per Section 15130 of the CEQA Guidelines, the discussion of cumulative impacts shall reflect the severity of the impacts and their likelihood of occurrence, but the discussion need not provide as great detail as is provided for the effects attributable to the project alone. The discussion should be guided by standards of practicality and reasonableness, and should focus on the cumulative impact to which the identified other projects contribute, rather than the attributes of other projects which do not contribute to the cumulative impact.

35.1.3 NEPA Requirements

Under NEPA, the Council of Environmental Quality (CEQ) regulations define cumulative impacts as the impact on environment, human, and community resources that result from the incremental impact of the proposed Project when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal on non-federal) or persons undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over time (40 CFR 1508.7, 1508.25.).

Reclamation's NEPA Handbook states that future cumulative impacts should not be speculative but should be based upon known or reasonably foreseeable long-range plans, regulations, operating agreements, or other information that establishes them as reasonably foreseeable (Reclamation 2012).

35.2 Methodology

The methodology used to identify and evaluate cumulative impacts in this DEIR/EIS was based upon both CEQA and NEPA requirements. For purposes of this DEIR/EIS, a cumulative impact was considered to be a change in the physical environment that would result from the combined implementation of the proposed Project or one of the alternatives with other projects that would cause related impacts. Cumulative impacts within the proposed Project's three study areas were identified based on: (1) information extracted from existing environmental documents or studies for the resource categories potentially affected by each project, (2) investigation of future project plans by other State and federal agencies and private entities, and (3) knowledge of expected effects of similar projects.

The cumulative analysis followed applicable guidance provided by CEQ in Considering Cumulative Effects under NEPA (CEQ 1997), Guidance on the Consideration of Past Actions in Cumulative Effects Analysis (CEQ 2005), Reclamation's NEPA Handbook (Reclamation 2012), and Guidelines for Implementation of the California Environmental Quality Act. Based on these resources, the following elements were determined necessary to provide an adequate discussion of significant cumulative impacts:

1. Either: a) a list of past, present, and probable future projects producing related or cumulative impacts, including, if necessary, those projects outside the control of the agency, or b) a summary of projections contained in an adopted local, regional or statewide plan, or related planning document, that describes or evaluates conditions contributing to the cumulative effect.
2. When utilizing a list, factors to consider when determining whether to include a related project should include the nature of each environmental resource being examined, the location of the project and its type.
3. A definition of the geographic scope of the area affected by the cumulative effect and a reasonable explanation for the geographic limitation used.
4. A summary of the expected environmental effects to be produced by those projects with specific reference to additional information stating where that information is available; and
5. A reasonable analysis of the cumulative impacts of the relevant projects, including examining reasonable, feasible options for mitigating or avoiding the project's contribution to any significant cumulative effects.

This cumulative impact assessment considered projects and programs ("projects") identified under Existing Conditions (which includes the current effects of past projects) and reasonably foreseeable and probable future projects. The criterion for considering whether a project was reasonably foreseeable and probable in this DEIR/EIS was whether the project had been defined in adequate detail, either through the completion of publicly available preliminary evaluations, feasibility studies, or draft environmental and engineering documents, to estimate potential impacts. Projects that were only in the development phase without detailed descriptions, operations criteria, or general locations as of April 2013 were not considered further.

35.3 Cumulative Project Selection

As discussed above, to identify the related cumulative projects, CEQA recommends either the "list" or "projection" approach. The list approach was used for this analysis.

For this DEIR/EIS, cumulative impacts within the proposed Project's study areas were identified based on: (1) assumptions developed as part of CALSIM II water supply modeling; (2) cumulative projects described in the CALFED Bay-Delta Program (CALFED) Programmatic EIS/EIR, and (3) information extracted from existing environmental documents or future project plans for similar projects. In addition, the following criteria, taken from the CALFED Programmatic EIS/EIR, were used to narrow the list of projects considered in the analysis:

- The action is under active consideration.
- The action's project-level environmental documentation is under preparation or has been completed.
- The action would be completed or operational within the timeframe being considered for the proposed Project (assumed to be 2020).
- The action, in combination with the proposed Project, would have the potential to affect the same resources. For example, the proposed Project would affect flow regimes and water quality along the Sacramento River and in the Sacramento-San Joaquin Delta (Delta). These potential changes, along with ecosystem restoration and/or water quality improvement programs in the Delta, could have a cumulative effect; therefore, the programs in the Delta were included in the cumulative analysis. In contrast, ongoing and future Delta levee repair/improvement projects to maintain existing flood channels or navigation channels or general plan updates/amendments for Delta counties in combination with the proposed Project are not anticipated to cause a cumulative effect and were not included in the discussion of cumulative impacts.

35.3.1 Cumulative Projects described in CALFED EIS/EIR

The CALFED Programmatic EIS/EIR compiled a list of major projects for consideration in its cumulative impact analysis. The list focused on future actions that could affect the physical features of the San Francisco Bay-Delta (Bay-Delta) system, and on the future federal and State policies that could affect operations of the Central Valley Project (CVP) and State Water Project (SWP). The CALFED Programmatic EIS/EIR list of cumulative projects, the CALFED Record of Decision (ROD), and other recent documents were used to identify projects considered in the cumulative effect analysis.

Many of the projects considered in the cumulative impacts analysis in the CALFED Programmatic EIS/EIR have been implemented, modified into other projects, or not pursued based upon results of separate evaluations, including:

- American River Water Resource Investigation (not pursued as a regional project)
- American River Watershed Project (construction either completed or underway – future projects will not affect water supply operations)
- Contra Costa Water District Multi-Purpose Pipeline Project (completed)
- Hamilton City Pumping Plant Fish Screen Improvement Project (completed)

- Montezuma Wetlands Project (long-term project underway for disposal of dredge spoils)
- Pardee Reservoir Enlargement (not pursued)
- Red Bluff Diversion Dam Fish Passage Improvement Project (completed)
- Sacramento River Flood Control System Evaluation (completed)
- Sacramento County CVP Water Service Contracts (completed)
- West Delta Water Management Program (not pursued)

The projects identified as cumulative projects in the CALFED Programmatic EIS/EIR that are considered in this cumulative effects analysis, and described in the following subsection, include:

- Implementation of Central Valley Project Improvement Act (CVPIA) actions
- Delta Wetlands
- South Delta Temporary Barriers
- Sacramento Water Forum Process (underway through Lower American River Flow Management Study)
- Trinity River Restoration Actions
- East Bay Municipal Utility District (EBMUD) Supplemental Water Supply Project

35.3.2 Program List of Related and Reasonably Foreseeable Projects and Actions

Table 35-1 lists projects considered for the cumulative effects section by resource area. Summaries of each project or action are provided below.

The projects and actions are organized in the following order:

- Multi-Region Projects and Actions
- Local Agency Projects and Actions in the vicinity of proposed North-of-the-Delta Offstream Storage (NODOS) Project facilities
- Water Supply, Water Quality, and Hydropower Projects and Actions in the vicinity of proposed NODOS Project facilities and/or potentially affected by SWP and CVP operations (organized geographically from north to south)
- Ecosystem Improvement Projects and Actions in the vicinity of proposed NODOS Project facilities and/or potentially affected by SWP and CVP operations (organized geographically from north to south)

Table 35-1
Present and Reasonably Foreseeable Future Actions Included in the Cumulative Impacts Analysis, by Resource Area

	Surface Water Resources and Surface Water Quality	Fluvial Geomorphology and Riparian Habitat	Flood Control and Management	Groundwater Resources and Quality	Aquatic Biological Resources	Botanical Resources	Terrestrial Biological Resources	Wetlands and Other Waters of the United States	Geology, Minerals, Soils, and Paleontology	Faults and Seismicity	Cultural Resources	Indian Trust Assets	Land Use	Recreation Resources	Socioeconomics	Environmental Justice	Air Quality	Climate Change and Greenhouse Gas Emissions	Navigation, Transportation, and Traffic	Noise	Public Health and Environmental Hazards	Public Services and Utilities	Visual Resources	Power Production and Energy
Multi-Regional Projects and Actions																								
Implementation of CVPIA	X			X	X	X	X	X				X	X	X	X	X							X	
Implementation of CALFED Objectives	X			X	X	X	X	X				X	X	X	X	X							X	
Bay-Delta Water Quality Control Plan Update	X	X	X	X	X	X	X	X					X	X	X	X								X
Bay Delta Conservation Plan	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
Delta Plan	X		X	X	X	X	X	X					X	X	X	X							X	
NMFS Public Draft Recovery Plan for Sacramento River Winter-run Chinook Salmon, Central Valley Spring-run Chinook Salmon, and Central Valley Steelhead	X	X		X	X	X	X	X					X	X	X	X								X
USFWS Recovery Plan for the Sacramento-San Joaquin Delta Native Fishes	X	X		X	X	X	X	X					X	X	X	X								X
Anadromous Fish Screen Program					X				X	X	X					X	X				X		X	
California Aquatic Invasive Species Rapid Response Plan					X	X	X	X						X	X	X								
Regional Advance Mitigation Program	X	X			X	X	X	X					X	X	X	X							X	

Table 35-1
Present and Reasonably Foreseeable Future Actions Included in the Cumulative Impacts Analysis, by Resource Area

	Surface Water Resources and Surface Water Quality	Fluvial Geomorphology and Riparian Habitat	Flood Control and Management	Groundwater Resources and Quality	Aquatic Biological Resources	Botanical Resources	Terrestrial Biological Resources	Wetlands and Other Waters of the United States	Geology, Minerals, Soils, and Paleontology	Faults and Seismicity	Cultural Resources	Indian Trust Assets	Land Use	Recreation Resources	Socioeconomics	Environmental Justice	Air Quality	Climate Change and Greenhouse Gas Emissions	Navigation, Transportation, and Traffic	Noise	Public Health and Environmental Hazards	Public Services and Utilities	Visual Resources	Power Production and Energy
Central Valley Vision													X	X	X	X							X	
Local Agency Projects and Actions in the Vicinity of the Proposed NODOS Project Facilities																								
County of Colusa 2030 General Plan				X									X		X								X	
Butte County Regional Conservation Plan		X			X	X	X	X					X	X	X	X							X	
Water Supply, Water Quality, and Hydropower Projects and Actions in the Vicinity of the Proposed NODOS Project Facilities and/or Potentially Affected by SWP And CVP Operations (Organized Geographically from North to South)																								
Increased Hydropower Generation Capacity at Lewiston Dam																								X
Shasta Lake Water Resources Investigation	X	X	X		X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
Woodland-Davis Water Supply Project	X								X	X	X				X	X	X	X	X	X	X	X	X	X
El Dorado Water and Power Authority Supplemental Water Rights Project	X				X			X																
El Dorado Irrigation District Folsom Lake Temperature Control Device	X				X			X	X	X	X					X	X			X	X	X		
Lake Natoma Lower American River Temperature Reduction Project	X				X			X																

Table 35-1
Present and Reasonably Foreseeable Future Actions Included in the Cumulative Impacts Analysis, by Resource Area

	Surface Water Resources and Surface Water Quality	Fluvial Geomorphology and Riparian Habitat	Flood Control and Management	Groundwater Resources and Quality	Aquatic Biological Resources	Botanical Resources	Terrestrial Biological Resources	Wetlands and Other Waters of the United States	Geology, Minerals, Soils, and Paleontology	Faults and Seismicity	Cultural Resources	Indian Trust Assets	Land Use	Recreation Resources	Socioeconomics	Environmental Justice	Air Quality	Climate Change and Greenhouse Gas Emissions	Navigation, Transportation, and Traffic	Noise	Public Health and Environmental Hazards	Public Services and Utilities	Visual Resources	Power Production and Energy
EBMUD Camanche Water Rights Permit Extension	X																							
EBMUD Water Supply Management Program 2040	X																							
Eastern San Joaquin Integrated Conjunctive Use Program	X			X																				
Semitropic Water Storage District Delta Wetlands	X			X		X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
North Bay Aqueduct Alternative Intake	X				X			X	X	X	X		X		X	X	X	X	X	X	X	X	X	X
Bay Area Regional Desalination Project	X								X	X	X				X	X	X	X	X	X	X	X	X	X
Los Vaqueros Reservoir Expansion Phase II	X						X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
South Delta Temporary Barriers Operations	X				X			X	X	X						X	X		X	X	X		X	
Stockton Deep Water Ship Channel Dissolved Oxygen Project	X				X			X																
Upper San Joaquin River Basin Storage Investigation	X		X					X	X	X	X		X		X	X	X	X	X		X	X	X	X

Table 35-1
Present and Reasonably Foreseeable Future Actions Included in the Cumulative Impacts Analysis, by Resource Area

	Surface Water Resources and Surface Water Quality	Fluvial Geomorphology and Riparian Habitat	Flood Control and Management	Groundwater Resources and Quality	Aquatic Biological Resources	Botanical Resources	Terrestrial Biological Resources	Wetlands and Other Waters of the United States	Geology, Minerals, Soils, and Paleontology	Faults and Seismicity	Cultural Resources	Indian Trust Assets	Land Use	Recreation Resources	Socioeconomics	Environmental Justice	Air Quality	Climate Change and Greenhouse Gas Emissions	Navigation, Transportation, and Traffic	Noise	Public Health and Environmental Hazards	Public Services and Utilities	Visual Resources	Power Production and Energy
FERC Relicense Renewal for Turlock Irrigation District and Modesto Irrigation District Don Pedro Project	X	X	X	X	X	X	X	X						X	X	X								X
FERC Relicense Renewal for Merced Irrigation District's Merced River Hydroelectric Project	X	X	X	X	X	X	X	X						X	X	X								X
Grassland Bypass Project	X						X	X	X	X	X		X		X	X	X	X	X		X	X	X	X
Central Valley RWQCB Irrigated Lands Regulatory Program	X														X									
Central Valley Salinity Alternatives for Long-term Sustainability (CV-SALTS)	X														X									X
San Luis Reservoir Low Point Improvement Project	X								X	X	X					X	X	X	X		X	X	X	X
San Luis Reservoir State Recreation Area Resource Management Plan/General Plan													X	X	X	X			X			X		

Table 35-1
Present and Reasonably Foreseeable Future Actions Included in the Cumulative Impacts Analysis, by Resource Area

	Surface Water Resources and Surface Water Quality	Fluvial Geomorphology and Riparian Habitat	Flood Control and Management	Groundwater Resources and Quality	Aquatic Biological Resources	Botanical Resources	Terrestrial Biological Resources	Wetlands and Other Waters of the United States	Geology, Minerals, Soils, and Paleontology	Faults and Seismicity	Cultural Resources	Indian Trust Assets	Land Use	Recreation Resources	Socioeconomics	Environmental Justice	Air Quality	Climate Change and Greenhouse Gas Emissions	Navigation, Transportation, and Traffic	Noise	Public Health and Environmental Hazards	Public Services and Utilities	Visual Resources	Power Production and Energy
Ecosystem Improvement Projects and Actions in the Vicinity of the Proposed NODOS Project Facilities and/or Potentially Affected by SWP and CVP Operations (Organized Geographically from North to South)																								
Trinity River Restoration Program		X		X	X	X	X	X	X	X	X		X	X	X	X	X			X	X	X	X	
Clear Creek Fisheries Habitat Restoration Program				X	X	X	X	X	X	X			X	X	X	X	X							
Clear Creek Mercury Abatement and Fisheries Restoration Project	X				X	X	X	X						X		X								
Iron Mountain Mine Superfund Site	X				X			X													X			
Mainstem Sacramento River Gravel Augmentation Program		X			X			X	X	X						X	X							
Cottonwood Creek Geomorphological Analyses and Sediment Budget		X			X			X	X	X						X	X							
Cottonwood Creek Non-Native Invasive Species Eradication Program						X	X	X						X		X								
Mill Creek Riparian Assessment					X	X	X	X						X		X								

Table 35-1
Present and Reasonably Foreseeable Future Actions Included in the Cumulative Impacts Analysis, by Resource Area

	Surface Water Resources and Surface Water Quality	Fluvial Geomorphology and Riparian Habitat	Flood Control and Management	Groundwater Resources and Quality	Aquatic Biological Resources	Botanical Resources	Terrestrial Biological Resources	Wetlands and Other Waters of the United States	Geology, Minerals, Soils, and Paleontology	Faults and Seismicity	Cultural Resources	Indian Trust Assets	Land Use	Recreation Resources	Socioeconomics	Environmental Justice	Air Quality	Climate Change and Greenhouse Gas Emissions	Navigation, Transportation, and Traffic	Noise	Public Health and Environmental Hazards	Public Services and Utilities	Visual Resources	Power Production and Energy
Deer Creek Irrigation District Dam Fish Passage Improvement and Flow Enhancement Project	X			X	X	X	X	X	X	X	X			X		X	X							
Yolo County Habitat/Natural Community Conservation Plan	X			X	X	X	X	X					X	X	X	X							X	
Yolo Bypass Wildlife Area Land Management Plan	X			X	X	X	X	X					X	X	X	X							X	
Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan	X			X	X	X	X	X	X	X	X		X	X	X	X	X	X			X		X	
Cache Slough Complex Restoration	X	X		X	X	X	X	X	X	X	X		X	X	X	X	X						X	
Lower Mokelumne River Spawning Habitat Improvement Project					X			X																
North Delta Flood Control and Ecosystem Restoration Project		X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	
Fish Screen Project at Sherman and Twitchell Islands					X				X	X	X					X	X		X		X		X	

Table 35-1
Present and Reasonably Foreseeable Future Actions Included in the Cumulative Impacts Analysis, by Resource Area

	Surface Water Resources and Surface Water Quality	Fluvial Geomorphology and Riparian Habitat	Flood Control and Management	Groundwater Resources and Quality	Aquatic Biological Resources	Botanical Resources	Terrestrial Biological Resources	Wetlands and Other Waters of the United States	Geology, Minerals, Soils, and Paleontology	Faults and Seismicity	Cultural Resources	Indian Trust Assets	Land Use	Recreation Resources	Socioeconomics	Environmental Justice	Air Quality	Climate Change and Greenhouse Gas Emissions	Navigation, Transportation, and Traffic	Noise	Public Health and Environmental Hazards	Public Services and Utilities	Visual Resources	Power Production and Energy
Dutch Slough Tidal Marsh Restoration	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	
Franks Tract Project	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X		X		X		X	
Solano County Multi-species Habitat Conservation Plan					X	X	X	X					X	X	X	X							X	
Suisun Marsh Habitat Management, Preservation, and Restoration Plan Implementation	X		X	X	X	X	X	X	X	X	X		X	X	X	X	X		X	X	X	X	X	
San Joaquin River Restoration Program	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X

Notes:
CALFED = CALFED Bay-Delta Program
CVP = Central Valley Project
CVPIA = Central Valley Project Improvement Act
EBMUD = East Bay Municipal Utility District
NMFS = National Marine Fisheries Service
NODOS = North-of-the-Delta Offstream Storage
RWQCB = Regional Water Quality Control Board
SWP = State Water Project
USFWS = U.S. Fish and Wildlife Service

35.3.3 Multi-Region Projects and Actions

The multi-region projects and actions considered in this cumulative impact assessment include:

- Implementation of the CVPIA
- Implementation of CALFED Objectives
- Bay-Delta Water Quality Control Plan Update
- Bay Delta Conservation Plan
- Delta Plan
- National Marine Fisheries Service (NMFS) Public Draft Recovery Plan for Sacramento River Winter run Chinook Salmon, Central Valley Spring-run Chinook Salmon, and Central Valley Steelhead
- U.S. Fish and Wildlife Service (USFWS) Recovery Plan for the Sacramento-San Joaquin Delta Native Fishes
- Anadromous Fish Screen Program
- California Aquatic Invasive Species Rapid Response Plan
- Regional Advance Mitigation Program
- Central Valley Vision

35.3.3.1 Implementation of Central Valley Project Improvement Act

The CVPIA of 1992 amends previous authorizations of the CVP, which is one of the world's largest systems for storing and moving water, to include fish and wildlife protection and mitigation having equal priority with irrigation, domestic uses, and power generation.

Since 1993, the U.S. Bureau of Reclamation (Reclamation) and USFWS have completed several major river projects under CVPIA, including restoration of Butte Creek and installation of fish screens in the Glenn-Colusa Irrigation District and Anderson-Cottonwood Irrigation District. Overall, the CVPIA Program completed 98 actions from the river restoration plan in 26 watersheds throughout the Central Valley, focusing on removal of barriers from rivers, floodplain restoration, and riverbed gravel supplementation. Reclamation has also assisted the State of California in construction of 29 fish screen diversions. CVPIA river restoration embodies the America's Great Outdoors Initiative[1] in many respects, including expansive ecological restoration.

River restoration within the CVP is a key aspect of meeting the CVPIA fisheries goal, which is to double the natural production of anadromous fish on a sustainable basis. The current scope of the CVPIA includes 15 programs that fall into three resource areas: fisheries, refuges, and other resources. Major ongoing fishery projects include the San Joaquin River Restoration Program in central California

[1] Federal initiative based on the premise that lasting conservation solutions should come from the American people. The initiative seeks to bring a more effective approach to land management, to encourage collaboration among government agencies and private citizens to protect our outdoor legacy, to fund programs that protect land, provide assistance to communities, and improve opportunities to get young people outdoors.

(described below), the Red Bluff Fish Passage Improvement Project (recently completed), and the Trinity River Restoration Program (described below) in northern California.

35.3.3.2 Implementation of CALFED Objectives

CALFED State and federal agencies worked to develop and initiate long-term programs to achieve four interrelated objectives:

- Levee System Integrity – to reduce risks to land use, economic activities, water supply, infrastructure, and ecosystems from catastrophic levee breaches.
- Ecosystem Restoration – to improve and increase aquatic and terrestrial habitats and ecological functions in the Bay-Delta.
- Water Supply Reliability – to provide reliable Bay-Delta water supplies for projected beneficial uses dependent upon the Bay-Delta system.
- Water Quality – to provide good water quality for all beneficial uses.

The CALFED ROD was signed in 2000. Over the following seven years, many conditions occurred that had been unforeseen either in occurrence or in extent during the preparation of the CALFED Programmatic EIS/EIR. These changing conditions included a better understanding of: (1) global climate change on hydrology and sea levels, (2) potential responses to seismic events throughout California, (3) continuing land subsidence in the Bay-Delta, (4) increased populations of introduced species, especially in the Bay-Delta system, and (5) changing population growth projections. At the end of seven years (Stage 1), CALFED prepared a summary of accomplishments that had occurred during the Stage 1 period, as summarized below.

- Levee System Integrity – The Levee System Integrity Program supported programs that increased protection for, maintenance of, and stability of nearly 745 miles of Delta levees, including the reuse of 1.36 million cubic yards of dredged material for levee stability and habitat improvement; and created approximately 50 acres of riparian and wetland habitat and 3,000 feet of shaded riverine aquatic habitat.
- Ecosystem Restoration – The Ecosystem Restoration Program (ERP) supported ecosystem restoration programs upstream of the Delta in the Sacramento and San Joaquin rivers watersheds, as well as in the Delta. Restoration improvements occurred in upland, grassland, wetland, riparian, non-tidal and tidal marsh, and aquatic habitats. The initial ERP reports were completed as part of the CALFED Programmatic EIS/EIR and have been updated several times since 2000. The ERP approach is to restore or mimic ecological processes and improve aquatic and terrestrial habitats to support stable, self-sustaining populations of diverse species.

CALFED's Water Supply Reliability Program objective is achieved through five program elements, including a Storage Program Element. The Storage Program Element includes an action that provides for additional water storage, including the proposed NODOS Project and the Upper San Joaquin River Basin Storage Investigation (described below).

35.3.3.3 Bay-Delta Water Quality Control Plan Update

In accordance with the federal Clean Water Act and the Porter-Cologne Water Quality Control Act, basins plans must be developed for each hydrologic area. Each basin plan must contain water quality

objectives to ensure the reasonable protection of beneficial uses, as well as a program of implementation for achieving water quality objectives. Federal regulations require each state to adopt water quality standards to protect the public health or welfare, enhance the quality of water, and serve the purposes of the Clean Water Act. In California, the beneficial uses and water quality objectives form the basis of the water quality control standards. In the Bay-Delta, water quality and flow objectives to meet water quality criteria are included in the *Water Quality Control Plan for the San Francisco Bay/Sacramento–San Joaquin Delta Estuary* (Bay-Delta WQCP). The State Water Resources Control Board (SWRCB) and the Central Valley and San Francisco Regional Water Quality Control Boards (RWQCBs) are in the process of updating the Bay-Delta WQCP. The updates, or amendments, are being prepared in two phases. Initially, the SWRCB and RWQCBs are evaluating new flow objectives for the Lower San Joaquin River and the tributaries of Stanislaus, Tuolumne, and Merced rivers; and southern Delta salinity objectives. The second phase involves evaluating changes to other portions of the Bay-Delta WQCP including Delta outflows, SWP and CVP export restrictions, and other requirements in the Bay-Delta to protect fish and wildlife beneficial uses. A third phase will consider and assign responsibility for implementing measures to achieve the water quality objectives established in the first two phases.

35.3.3.4 Bay Delta Conservation Plan

The Bay Delta Conservation Plan (BDCP) is a multiple-stakeholder Habitat Conservation Plan (HCP) and Natural Community Conservation Plan (NCCP) designed to make significant contributions to the recovery of covered species and restore a more naturally functioning Delta ecosystem while securing a reliable freshwater source from the Delta for human use. The BDCP is currently being developed through a collaboration of DWR, Reclamation, Metropolitan Water District of Southern California, Kern County Water Agency, Santa Clara Valley Water District, Zone 7 Water Agency, San Luis and Delta-Mendota Water Authority, and Westlands Water District. The BDCP includes actions to restore native fish, wildlife, and plant habitat in the Delta; modify SWP and CVP Delta water conveyance facilities and operations in the Delta; and reduce other ecological stressors that impair the function or the use of desirable habitat for ecosystem restoration or recovery in the Delta, such as physical barriers to fish migration (including levees, weirs, or gates), non-native and invasive species, and poor water quality.

The BDCP EIR/EIS was developed by DWR, Reclamation, USFWS, and NMFS. The BDCP EIR/EIS evaluates a range of alternatives that combine ecosystem restoration approaches and Delta conveyance approaches. During the last 50 years, several broad conveyance approaches have been studied to address urban water quality, water supply reliability, and environmental concerns in the Delta: physical barriers, hydraulic barriers, through-Delta facilities, and isolated facilities. Several alternative Delta conveyance facilities are being evaluated as part of the BDCP EIR/EIS. Among these alternatives are use of an isolated facility that would convey water around the Delta for local supply and export through a hydraulically isolated channel or pipeline and with continual use of the existing south Delta intakes (dual conveyance alternatives); and continuation of the use of the through-Delta conveyance with channel modifications.

35.3.3.5 Delta Plan

The Delta Stewardship Council was established by the California legislature in 2009 through the Delta Reform Act. The Delta Reform Act also required development of a legally enforceable, comprehensive, long-term management plan for the Delta, referred to as the Delta Plan. The Delta Plan will be a legally enforceable, comprehensive, long-term management plan for the Delta and the Suisun Marsh that

achieves the coequal goals (Water Code section 85300(a)). Water Code section 85054 defines the coequal goals as follows:

> *Coequal goals mean the two goals of providing a more reliable water supply for California and protecting, restoring and enhancing the Delta ecosystem. The coequal goals shall be achieved in a manner that protects and enhances the unique cultural, recreational, natural resource and agricultural values of the Delta as an evolving place.*

The Delta Reform Act states that the policy of the State is:

> *… to achieve the following objectives as inherent in the coequal goals for the management of the Delta:*
>
> *(a) Manage the Delta's water and environmental resources and the water resources of the state over the long term.*
>
> *(b) Protect and enhance the unique cultural, recreational, and agricultural values of the California Delta as an evolving place.*
>
> *(c) Restore the Delta ecosystem, including its fisheries and wildlife, as the heart of a healthy estuary and wetland ecosystem.*
>
> *(d) Promote statewide water conservation, water use efficiency, and sustainable water use.*
>
> *(e) Improve water quality to protect human health and the environment consistent with achieving water quality objectives in the Delta.*
>
> *(f) Improve the water conveyance system and expand statewide water storage.*
>
> *(g) Reduce risks to people, property, and state interests in the Delta by effective emergency preparedness, appropriate land uses, and investments in flood protection.*
>
> *(h) Establish a new governance structure with the authority, responsibility, accountability, scientific support, and adequate and secure funding to achieve these objectives" (Water Code section 85020 et. seq.).*

The Delta Plan could address water resources projects, including improved infrastructure related to storage projects, including the proposed NODOS Project. The Delta Plan also could include recommendations related to the sustainable use of water and reduced reliance on the Delta in meeting California's future water supply needs through a statewide strategy of investing in improved regional supplies, conservation, and water use efficiency.

35.3.3.6 National Marine Fisheries Service Public Draft Recovery Plan for Sacramento River Winter-run Chinook Salmon, Central Valley Spring-run Chinook Salmon, and Central Valley Steelhead

The NMFS Draft Recovery Plan provides a roadmap that describes the steps, strategy, and actions that should be taken to return winter-run Chinook salmon, spring-run Chinook salmon, and steelhead to viable status in the Central Valley, California, thereby ensuring their long-term persistence and evolutionary potential. The general near-term strategic approach to recovery includes the following elements:

- Secure all extant populations.
- Begin collecting distribution and abundance data for *O. mykiss* in habitats accessible to anadromous fish.
- Minimize straying from hatcheries to natural spawning areas.
- Conduct critical research on fish passage above rim dams, reintroductions, and climate change.

The long-term approach to recovery includes the following elements:

- Ensure that every extant diversity group has a high probability of persistence.
- Until all ESU viability criteria have been achieved, no population should be allowed to deteriorate in its probability of persistence.
- High levels of recovery should be attempted in more populations than identified in the diversity group viability criteria because not all attempts will be successful.
- Individual populations within a diversity group should have persistence probabilities consistent with a high probability of diversity group persistence.
- Within a diversity group, the populations restored/maintained at viable status should be selected
- Allow for normative meta-population processes, including the viability of core populations, which are defined as the most productive populations.
- Allow for normative evolutionary processes, including the retention of the genetic diversity as well as an increase in genetic diversity through the addition of viable populations in historic habitats.
- Minimize susceptibility to catastrophic events.

35.3.3.7 USFWS Recovery Plan for the Sacramento-San Joaquin Delta Native Fishes

The USFWS Recovery Plan addresses the recovery needs for several fish species that occupy the Delta, including delta smelt, Sacramento splittail, longfin smelt, green sturgeon, Chinook salmon (spring-run, late fall-run, and San Joaquin fall-run), and Sacramento perch (believed to be extirpated). The objective of the plan is to establish self-sustaining populations of these species that will persist indefinitely. This would be accomplished by managing the estuary to provide better habitat for aquatic life in general and for the fish addressed by the plan. Recovery actions include tasks such as increasing freshwater flows; reducing entrainment losses to water diversions; reducing the effects of dredging, contaminants, and harvest; developing additional shallow-water habitat, riparian vegetation zones, and tidal marsh; reducing effects of toxic substances from urban non-point sources; reducing the effects of introduced species; and conducting research and monitoring.

35.3.3.8 Anadromous Fish Screen Program

The primary objective of the Anadromous Fish Screen Program is to protect juvenile Chinook salmon, steelhead, green and white sturgeon, striped bass, and American shad from entrainment at priority diversions throughout the Central Valley. Section 3406 (b)(21) of the CVPIA requires the Secretary of the Interior to assist the State of California in developing and implementing measures to avoid losses of juvenile anadromous fish resulting from unscreened or inadequately screened diversions on the Sacramento and San Joaquin rivers, their tributaries, the Delta, and the Suisun Marsh.

35.3.3.9 California Aquatic Invasive Species Rapid Response Plan

The California Department of Fish and Wildlife[2] (CDFW) released the final California Aquatic Invasive Species Management Plan in January 2008. As part of this plan, the Aquatic Invasive Species Rapid Response Plan is proposed for the State of California. The Rapid Response Plan establishes a draft general procedure for rapid response following detection of new aquatic invasive species infestation. It provides a framework for developing and implementing a rapid response plan. It is preliminary in that it describes types of information, resources and decisions necessary to finalize the plan. In order to finalize, fund, and implement the draft Rapid Response Plan, CDFW expects that cooperating agencies will assign staff to participate. CDFW Invasive Species Program staff will provide coordination for the interagency activities called for in the agreement(s).

35.3.3.10 Giant Garter Snake Recovery Plan

The Draft Giant Garter Snake Recovery Plan was published by USFWS in 1999, but a final plan was not published. However, USFWS continues to implement the recovery plan with a 5-year analysis that considers threats, conservation measures, and regulatory mechanisms.

The giant garter snake inhabits wetland habitats within the Central Valley. Loss and fragmentation of wetland habitats have extirpated the giant garter snake from the majority of its historic range. The recovery plan also considers several species of concern that occur in Central Valley wetlands that benefit from actions taken to recover the giant garter snake. These species include the tricolored blackbird, white-faced ibis, western pond turtle, and associated waterfowl.

The ultimate goal of the recovery plan is to delist the giant garter snake. Recovery criteria for the giant garter snake are defined for four recovery units in the Central Valley: the Sacramento Valley, Mid-Valley, San Joaquin Valley, and South Valley units. Recovery criteria include:

a) Monitoring shows that in 17 out of 20 years, 90 percent of the subpopulations in four recovery units contain both adults and young.

b) All extant populations within the recovery unit are protected from threats that limit populations.

c) Supporting habitat within the recovery unit is adaptively managed and monitored.

d) Subpopulations are well connected by corridors of suitable habitat.

e) Repatriation (reintroduction) has been successful at a specified number of suitable sites

[2] Formerly known as the California Department of Fish and Game (i.e., prior to January 1, 2013).

Necessary actions described in the plan include protecting existing populations and habitat; restoring populations to former habitat; surveying to determine species distributions; monitoring populations; conducting necessary research, including studies on demographics, population genetics, and habitat use; and developing and implementing incentive programs, and an outreach and education plan.

35.3.3.11 Regional Advance Mitigation Program

The Regional Advance Mitigation Program (RAMP) attempts to provide a method to achieve faster, less expensive, and better mitigation for unavoidable impacts associated with infrastructure projects on a landscape scale rather than by project-by-project mitigation. RAMP Work Group participants include federal and State agencies (including DWR, CDFW, U.S. Environmental Protection Agency, U.S. Army Corps of Engineers (USACE), and California Department of Transportation [Caltrans]).

The basic RAMP concept is twofold. First, it establishes a regional framework for identifying existing and potential mitigation approaches in a geographically specific portion of the State that could support the needs of planned infrastructure projects and meet the needs of regulatory agencies. Second, it identifies which mitigation approaches could best create habitat in advance of potential unavoidable impacts of infrastructure projects. Working together, natural resource and infrastructure funding agencies can estimate mitigation needs early in the projects' timelines, avoiding permitting and regulatory delays and allowing public mitigation dollars to stretch further by securing and conserving valuable natural resources.

DWR and Caltrans are leading development of the RAMP initiative using bond funding, but will actively seek additional voluntary partners as the structure for long-term funding and governance is more clearly defined. RAMP does not supply permits for infrastructure projects; rather, its purpose is to provide a more efficient and cost-effective option for supplying mitigation within existing permitting processes. Infrastructure agencies will individually apply for their permits to perform actions. Within the application materials, they could reference an advance mitigation site created through RAMP. These sites may be authorized by the resource agencies using the same methodology as a private commercial mitigation bank and other agencies, or authorized using alternative methods supported by these same agencies. The RAMP Work Group developed a Draft Statewide Framework for Regional Advance Mitigation Planning in California intended to convey to lawmakers and agency leaders the goals, benefits, and operational framework of a statewide RAMP initiative.

35.3.3.12 Central Valley Vision

In 2003, the California Department of Parks and Recreation (State Parks) began work on a long-term Central Valley Vision to develop a strategic plan for State Parks expansion in the Central Valley. The plan will provide a 20-year road map for State Parks actions to focus on increasing service to Valley residents and visitors. Within the Great Central Valley (San Joaquin Valley, Sacramento Valley and the Delta region), State Parks operates and maintains 32 State park units representing seven percent of the total State park system acreage. The 2009 Central Valley Vision Implementation Plan proposed 11 new parks in the Central Valley and several park expansion projects. Several of the new and expanded parks are/would be located near the proposed NODOS Project facilities, including:

- Proposed Anderson-Sacramento River Park (approximately 225 acres along the Sacramento River with campsites, picnic sites, trails, fishing and boating access, and interpretative services)
- Proposed Big Bend Park (approximately 2,000 acres along the Sacramento River with campsites, picnic sites, trails, fishing and boating access, and interpretative services)

- Expand Woodson Bridge State Recreation Area (add a 700-acre parcel along Kopta Slough and restore 180-acres of habitat)
- Expand Colusa-Sacramento River State Recreation Area (add 13 acres and restore 140 acres of habitat; and add campsites, picnic sites, fishing and boating access, and interpretative services)
- Expand State Park at Sutter Buttes (acquire approximately 1,000 acres and add campsites, picnic sites, trails, and interpretative services)
- Proposed Sacramento River Boating Trail (from Redding to Sacramento with boat-in campsites and day use areas at existing parks and marinas, and interpretative services)

Other new and expanded parks are/would be located near SWP and CVP facilities, including:

- Expand campsites, picnic sites, trails, and boating facilities at Lake Oroville State Recreation Area.
- Expand track, picnic, and day use facilities at Clay Pit State Vehicular Recreation Area
- Proposed Sacramento and Feather River Boating Trail (from Redding to Sacramento and Oroville to Sacramento with boat-in campsites and day use areas and interpretative services)
- Proposed Elkhorn Basin (approximately 1,500 acres along Sacramento River near confluence with Feather River)
- Improve Folsom Lake State Recreation Area and Folsom Powerhouse State Historic Park (add campsites, picnic sites, fishing and boating access, and interpretative services; and add trails to connect to Deer Creek Hills Preserve)
- Proposed Sacramento River Boating Trail (from Sacramento through the Delta)
- Expand Delta Meadows California State Parks property (acquire approximately 230 acres; and add campsites, picnic sites, fishing and boating access, and interpretative services)
- Proposed Barker Slough Park (near the North Bay Aqueduct Pumping Plant – transfer approximately 500 acres from DFW to California State Parks; restore habitat; and add picnic sites, boating access, and interpretative services)
- Expanded Caswell Memorial State Park (acquire approximately 200 acres; restore a portion for habitat; and add campsites, picnic sites, trails, and interpretative services)
- Proposed San Joaquin River Parkway (approximately 1,250 acres of public land along the San Joaquin River; and add campsites, picnic sites, trails, boating access, and interpretative services)

The Central Valley Vision also recommended development of several heritage corridors, including:

- California Delta Heritage Corridor (to connect Delta towns, recreation sites, nature areas, and agricultural sites)
- Cross-California Ecological Corridor (to connect recreation lands such as Sutter National Wildlife Refuge and South Yuba River State Park with natural areas)
- Central Valley Farm Trails Heritage Corridor (to connect agricultural sites, communities, historic sites, and water facilities along the State Highway 99 and Interstate 5 corridors in the Central Valley)

- Echoes of Our Ancestors Heritage Corridor (to connect areas that are representative of California's ethnic diversity in the Central Valley)

35.3.4 Local Agency Projects and Actions in the Vicinity of North-of-the-Delta Offstream Storage Project Facilities

The local agency projects and actions in the vicinity of the proposed NODOS Project facilities considered in this cumulative impact assessment include:

- Colusa County General Plan Update
- Butte County Habitat Conservation Plan

35.3.4.1 Colusa County 2030 General Plan

The County of Colusa 2030 General Plan, adopted on July 31, 2012, supersedes and replaces the County's 1989 General Plan. The 2030 General Plan carries forward much of the major goal and policy framework of the 1989 General Plan, but has been reorganized to make the document more user-friendly. The Plan identifies the County's vision for the future and provides a framework that will guide decisions on growth, development, and conservation of open space and resources in a manner consistent with the quality of life desired by the County's residents and businesses.

35.3.4.2 Butte County Regional Conservation Plan

The Butte Regional Conservation Plan (BRCP) is being coordinated by the Butte County Association of Governments (BCAG) on behalf of Butte County; cities of Chico, Oroville, Gridley, and Biggs; Western Canal Water District, the Richvale Irrigation District, the Biggs West-Gridley Water District, Butte Water District, and Caltrans. The BRCP is both a federal Habitat Conservation Plan (HCP) and a state Natural Community Conservation Plan (NCCP). It is a voluntary plan that will provide streamlined endangered species act permitting for transportation projects, land development and other covered activities over the 30-50 year term of the permits. It will also provide comprehensive species, wetlands and ecosystem conservation and contribute to the recovery of endangered species within the Plan Area. The BRCP will:

- Reduce the cost and increase the consistency of the State and federal permitting process;
- Provide certainty of regulatory costs and requirements;
- Provide local control by consolidating and streamlining environmental permitting under one locally controlled plan;
- Provide improved habitat preserves for species; and
- Protect the right of private property owners- conservation land acquisition will be through willing sellers only.

The first administrative draft of the BRCP was prepared in June 2011. A preliminary public draft was released in November 2012. The scoping process was initiated on December 14, 2012 with the publication of the Notice of Preparation of an EIS/EIR for the plan. The project is scheduled to be completed in 2013.

35.3.5 Water Supply, Water Quality, and Hydropower Projects and Actions in the Vicinity of the Proposed NODOS Project Facilities and/or Potentially Affected by SWP and CVP Operations (organized geographically from north to south)

The water supply, water quality, and hydropower projects and actions in the vicinity of the proposed NODOS Project facilities and/or potentially affected by SWP and CVP operations considered in this cumulative impact assessment include:

- Increased Hydropower Generation Capacity at Lewiston Dam
- Shasta Lake Water Resources Investigation
- Woodland-Davis Water Supply Project
- El Dorado Water and Power Authority Supplemental Water Rights Project
- El Dorado Irrigation District Folsom Lake Temperature Control Device
- Lake Natoma Lower American River Temperature Reduction Project
- EBMUD Camanche Water Rights Permit Extension
- EBMUD Water Supply Management Program 2040
- Eastern San Joaquin Integrated Conjunctive Use Program
- Semitropic Water Storage District Delta Wetlands
- North Bay Aqueduct Alternative Intake
- Bay Area Regional Desalination Project
- Los Vaqueros Reservoir Expansion Phase II
- South Delta Temporary Barriers Operations
- Stockton Deep Water Ship Channel Dissolved Oxygen Project
- Upper San Joaquin River Basin Storage Investigation
- FERC Relicense Renewal for Turlock Irrigation District and Modesto Irrigation District Don Pedro Project
- FERC Relicense Renewal for Merced Irrigation District's Merced River Hydroelectric Project
- Grassland Bypass Project
- Central Valley RWQCB Irrigated Lands Regulatory Program
- Central Valley Salinity Alternatives for Long-term Sustainability (CV-SALTS)
- San Luis Reservoir Low Point Improvement Project
- San Luis Reservoir State Recreation Area Resource Management Plan/General Plan

35.3.5.1 Increased Hydropower Generation Capacity at Lewiston Dam

The Trinity Public Utilities District (TPUD) and Reclamation intend to increase the power generating capacity at the Lewiston Dam, located near Weaverville, California, from the existing 350 kilowatts to approximately 2.2 megawatts. This upgrade will not only allow for better control of the flow from the dam to the Trinity River, but also provide an increase in revenue from power generation. Power generated by this project could be available for CVP water facilities operations, preference power customers served by Western Area Power Administration, or local electricity users served by TPUD.

35.3.5.2 Shasta Lake Water Resources Investigation

The Shasta Lake Water Resources Investigation is currently being conducted by Reclamation to determine the type and extent of federal interest in a multiple purpose plan to modify Shasta Dam and Reservoir to increase the survival of anadromous fish populations in the upper Sacramento River and increase water supplies and water supply reliability for agricultural, municipal, industrial, and environmental purposes. To the extent possible through meeting these objectives, alternatives include features to benefit other identified water and related resource needs including ecosystem conservation and enhancement, improved hydropower generation capability, flood damage reduction, increased recreation opportunities, and improved water quality conditions in the Sacramento River and the Delta consistent with CALFED objectives. Anticipated alternatives for expansion of Shasta Lake include, among other features, raising the dam from 6.5 to 18.5 feet above current elevation, which would result in additional storage capacity of 256,000 to 634,000 acre-feet, respectively. The increased capacity is expected to improve water supply reliability and increase the cold water pool, which would provide improved water temperature conditions for anadromous fish in the Sacramento River downstream of the dam.

35.3.5.3 Woodland-Davis Water Supply Project

The Woodland-Davis Water Supply Project has been proposed by the Woodland Davis Clean Water Agency for the cities of Davis and Woodland, and the University of California, Davis (UCD). The project would divert up to approximately 45,000 acre-feet per year of surface water from the Sacramento River and convey it for treatment and subsequent use in Davis, Woodland, and on the UCD campus. The purpose of the project is to provide a reliable water supply to meet existing and future needs, improve water quality for drinking supply purposes, and improve treated wastewater effluent quality through 2040. Project activities would include construction and operation of a water intake/diversion, conveyance, and water treatment facilities. Surface water supplies would be acquired through new water rights and water rights transfers from senior water rights holders.

The project would be located in the east-central portion of Yolo County, between and within the cities of Woodland and Davis, the UCD campus, and west of the Sacramento River. The new water diversion facility would be constructed on the Sacramento River near the Interstate 5 crossing at the location of the existing Reclamation District 2035 diversion. The water treatment plant to treat the surface water diverted from the Sacramento River would have an ultimate capacity of up to 64 millions of gallons per day.

Project water diversions would be made in compliance with Standard Water Right Permit Term 91, which prohibits surface water diversions when water is being released from CVP or SWP storage reservoirs to meet in-basin entitlements, including water quality and environmental standards for protection of the Delta. Water supply needs during periods applicable to Term 91 would be satisfied by entering into water supply transfer agreements with senior water rights holders within the Sacramento River watershed.

35.3.5.4 El Dorado Water and Power Authority Supplemental Water Rights Project

The El Dorado Water and Power Authority (EDWPA) proposes to establish permitted water rights allowing diversion of water from the American River basin to meet planned future water demands in the El Dorado Irrigation District (EID) and Georgetown Divide Public Utility District (GDPUD) service areas, and other areas located within El Dorado County that are outside of these service areas. EDWPA will be filing with the State Water Resources Control Board, Division of Water Rights, petitions for partial assignment of each of State Filed Applications 5644 and 5645, and accompanying applications allowing for the total withdrawal for use of 40,000 acre-feet per year, consistent with the diversion and storage locations allowed under the El Dorado-Sacramento Municipal Utility District (SMUD) Cooperation Agreement.

35.3.5.5 El Dorado Irrigation District Folsom Lake Temperature Control Device

The El Dorado Irrigation District (EID), in collaboration with Reclamation, proposes to construct facilities on the bank of Folsom Lake to withdraw water from the warm upper reaches of the lake while preserving the cold water pool at the bottom of the lake to protect downstream aquatic species. The facilities will include a large diameter concrete-lined vertical shaft and five lined horizontal adits extending from the shaft. This structure, known as a Temperature Control Device (TCD), will replace the District's five existing raw pump casings that currently extract water from Folsom Lake. The new facility will be sized to accommodate over twice the current capacity.

35.3.5.6 Lake Natoma Lower American River Temperature Reduction Project (Formerly the Lake Natoma Temperature Curtains Pilot Project)

The USFWS, Reclamation, and Sacramento Water Forum are proposing the Lower American River Temperature Reduction Modeling Project. The objective of the project is to develop predictive tools that will: 1) Reduce uncertainties in the performance of identified temperature control actions that could be implemented to improve the management of cold water resources in the Folsom/Natoma reservoir system and the lower American River, and 2) Be available for daily operations, planning, and salmon and steelhead habitat studies by other project operators and other stakeholders.

The project adapted, calibrated, and verified existing thermodynamic and hydrologic mathematical models for application at Folsom Reservoir, Lake Natoma and the lower American River. The models were used to assess the effectiveness of the identified actions individually and in combination and develop a recommendation for development and implementation of one or more actions for the purpose of reducing temperatures in the lower American River. The actions identified to improve transport of cold water through Lake Natoma and reduce the temperature of the lower American River included: a Nimbus Dam curtain, a Lake Natoma plunge zone curtain, Nimbus powerplant debris wall removal, dredging Lake Natoma, and modifying Folsom Powerplant peak loading operation.

35.3.5.7 EBMUD Camanche Water Rights Permit Extension

The Camanche Permit Extension would extend the term of the existing East Bay Municipal Utility District's (EBMUD) Camanche water right Permit 10478 through the year 2040 to divert water from the Mokelumne River for use in the EBMUD service area. Extending the Camanche Permit would allow EBMUD additional time to apply the water provided under Permit 10478 to municipal and industrial use within EBMUD's designated service area. Additionally, EBMUD has submitted documentation that describes that the full entitlement of Permit 10478 through 2040 is needed to maintain operational

flexibility to meet future projected water demand and address system vulnerabilities associated with several factors, including emergencies and potential effects of climate change.

35.3.5.8 EBMUD Water Supply Management Program 2040

EBMUD's current Water Supply Management Program (WSMP 2020), adopted in 1993, serves as the basis for water conservation and recycling programs and for development of supplemental supply initiatives such as the Freeport Regional Water Project. The WSMP 2040 updates the current plan and extends the planning horizon another 20 years. It identifies and recommends a Preferred Portfolio of solutions to meet dry-year water needs through 2040, including desalination and enlargement of Mokelumne River reservoirs.

The primary objectives of the WSMP 2040 are to maintain and improve EBMUD's water supply reliability to its customers and help meet the need for water in the future. WSMP 2040 will also adapt the EBMUD's water planning approach to circumstances that have changed since WSMP 2020 was adopted, such as competing and changing demands for water, the availability of Freeport water after 2009, and long-term climate change. EBMUD adopted the Revised WSMP 2040 Final Plan in April 2012.

35.3.5.9 Eastern San Joaquin Integrated Conjunctive Use Program

The purpose of the Integrated Conjunctive Use Program is to develop approximately 140,000 to 160,000 acre-feet per year of new surface water supply for the Eastern San Joaquin Basin that will be used to directly and indirectly support conjunctive use by the Northeastern San Joaquin County Groundwater Banking Authority (GBA) member agencies. This amount of water would support groundwater recharge at a level consistent with the GBA's objectives for conjunctive use and the underlying groundwater basin. Within this framework, the program would implement the following categories of conjunctive use projects and actions:

- Water conservation measures
- Water recycling
- Groundwater banking
- Water transfers
- Development of surface storage facilities
- Groundwater recharge
- River withdrawals
- Construction of pipelines and other facilities

To enable and facilitate sustainable and reliable management of San Joaquin County's water resources, the GBA developed a series of Basin Management Objectives to support conjunctive use and address a variety of water resources issues, including groundwater overdraft, saline groundwater intrusion, degradation of groundwater quality, environmental quality, land subsidence, supply reliability, water demand, urban growth, recreation, agriculture, flood protection, and other issues. The purpose of the Basin Management Objectives is to ensure the long-term sustainability of water resources in the San Joaquin Region.

35.3.5.10 Semitropic Water Storage District Delta Wetlands

In 1987, Delta Wetlands, a California Corporation, proposed a project for water storage and wildlife habitat enhancement on four privately owned islands in the Delta. The four islands were Bacon Island and Bouldin Island in San Joaquin County, and Holland Tract and Webb Tract in Contra Costa County,

encompassing approximately 23,000 acres. The Delta Wetlands Project would store water on two Reservoir Islands (Bacon Island and Webb Tract) for subsequent release into the Delta, and habitat enhancement to compensate for wetland and wildlife effects of the water storage operations with a Habitat Management Plan (HMP) on two Habitat Islands (Bouldin Island and Holland Tract).

In 2007, the Delta Wetlands Project partnered with the Semitropic Water Storage District (Semitropic WSD) to: 1) provide water to Semitropic WSD to augment its water supply, and bank water within the Semitropic Groundwater Storage Bank and Antelope Valley Water Bank. The designated places of use for Delta Wetlands Project water would include: Semitropic Water Storage District; Member Agencies of the Metropolitan Water District of Southern California, the Western Municipal Water District of Riverside County, and select service areas of the Golden State Water Company. The project would include improvements of 27 miles of levees and screened diversions to divert water during high-flow periods in the winter months of December through March into Webb Tract (100,000 acre-feet of storage) and Bacon Island (115,000 acre-feet of storage). The water would not be diverted in a manner that would adversely affect senior legal water rights holders, including the SWP and CVP. Stored water would be discharged into False River (from Webb Tract) and Middle River (from Bacon Island) for export when excess SWP or CVP diversion capacity is available, in the summer and fall months of July through November. Any water that could not be exported from the Delta in a given year would be available to increase Delta outflow in the fall months of September through November. Semitropic WSD issued a Draft EIR in 2010 and a Final EIR in 2011.

35.3.5.11 North Bay Aqueduct Alternative Intake

DWR issued a Notice of Preparation on December 2, 2009 to construct and operate an alternative intake on the Sacramento River, generally upstream of the Sacramento Regional Wastewater Treatment Plant, and connect it to the existing North Bay Aqueduct system by a new segment of pipe. The proposed alternative intake would be operated in conjunction with the existing North Bay Aqueduct intake at Barker Slough. The proposed project would be designed to improve water quality and to provide reliable deliveries of State Water Project supplies to its contractors, the Solano County Water Agency, and the Napa County Flood Control and Water Conservation District.

35.3.5.12 Bay Area Regional Desalination Project

The Bay Area's four largest water agencies (EBMUD, Contra Costa Water District (CCWD), Santa Clara Valley Water District, and the San Francisco Public Utility Commission) are jointly exploring the development of regional desalination facilities that would benefit Bay Area residents and businesses served by these agencies. The Bay Area Regional Desalination Project could consist of one or more desalination facilities, with an ultimate total capacity of up to 71 million gallons per day. The project would provide an additional source of water during emergencies, such as earthquakes or levee failures, increase supply reliability, and provide water during droughts or maintenance of other facilities. A pilot plant was constructed at Mallard Slough. The water agencies are reviewing the results of the pilot study.

35.3.5.13 Los Vaqueros Reservoir Expansion Phase II

Los Vaqueros Reservoir is an off-stream reservoir in the Kellogg Creek watershed to the west of the Delta. The Los Vaqueros Reservoir initial construction was completed in 1997 as a 100,000 acre-foot off-stream storage reservoir owned and operated by CCWD to improve delivered water quality and emergency storage reliability for CCWD's customers. In 2012, the Los Vaqueros Reservoir was expanded to a total storage capacity of 160,000 acre-feet (Phase 1) to provide additional water quality and supply

reliability benefits, and to adjust the timing of its Delta water diversions to accommodate the life cycles of Delta aquatic species, thus reducing species impact and providing a net benefit to the Delta environment. As part of the Storage Investigation Program described in the CALFED ROD, additional expansion up to 275,000 acre-feet (Phase 2) is being evaluated by CCWD, DWR, and Reclamation. The alternatives considered in the evaluation also consider methods to convey water from Los Vaqueros Reservoir to the South Bay Aqueduct to provide water to Zone 7 Water Agency, Alameda County Water District, and Santa Clara Valley Water District.

35.3.5.14 South Delta Temporary Barriers Operations

The South Delta Temporary Barriers Project was initiated as a test project in 1991. The South Delta Temporary Barriers Project consists of three rock barriers and one non-physical barrier across South Delta channels to increase water levels, improve water circulation patterns and water quality in the southern Delta for local agricultural diversions, and improve operational flexibility of the SWP to help reduce fishery impacts and improve fishery conditions. The barriers have been installed at the Head of Old River (HOR), Middle River, Old River near Tracy, and Grantline Canal. Installation of the barriers is dependent upon flow conditions, presence of specific fish species in the South Delta near water intakes, requirements of water users, and regulatory requirements of CDFW, USFWS, NMFS, and USACE. The barrier at the HOR serves as a fish barrier (intended to primarily benefit migrating San Joaquin River Chinook salmon) and is installed and operated in April-May and again in September-November. The remaining three barriers (Old River at Tracy, Grant Line Canal, Middle River) serve as agricultural barriers (intended to primarily benefit agricultural water users in the south Delta) and are installed and operated between April 15 and November 30 of each season. In 2008, a court order designed to protect delta smelt prohibited the installation of the spring HOR barrier pending fishery agency actions or further order of the court. The remaining three barriers serve as agricultural barriers and are installed between April 15 and September 30 of each season. An experimental underwater, non-physical barrier was installed near the HOR in 2009.

35.3.5.15 Stockton Deep Water Ship Channel Demonstration Dissolved Oxygen Project

The Stockton Deep Water Ship Channel Demonstration Dissolved Oxygen Project is a multiple-year study of the effectiveness of elevating dissolved oxygen (DO) concentrations in the channel. DO concentrations drop as low as two to three milligrams per liter (mg/L) during warmer and lower water flow periods in the San Joaquin River. The low DO levels can adversely affect aquatic life including the health and migration behavior of anadromous fish (e.g., salmon). The objective of the study is to maintain DO levels above the minimum recommended levels specified in the State of California WQCP (Basin Plan) for the Sacramento River and San Joaquin River basins. The Basin Plan water quality objectives for DO are 6.0 mg/l in the San Joaquin River (between Turner Cut and Stockton, 1 September through 30 November) and 5.0 mg/l the remainder of the year.

The project's full-scale aeration system includes two 200-foot-deep u-tube aeration tubes; two vertical turbine pumps capable of pumping over 11,000 gallons of water each; a liquid-to-gas oxygen supply system; and numerous pieces of ancillary equipment and control systems. The system has been sized to deliver approximately 10,000 pounds of oxygen per day into the Deep Water Ship Channel. The aeration system is anticipated to be operated only when channel DO levels are below the Basin Plan DO water quality objectives (approximately 100 days per year). The project includes an on-going assessment of DO levels in the channel and vicinity and a study of potential adverse effects of low DO on salmon.

35.3.5.16 Upper San Joaquin River Basin Storage Investigation (Previously described as Temperance Flat Reservoir)

The Upper San Joaquin River Basin Storage Investigation is being conducted by Reclamation and DWR to evaluate alternative plans to increase Upper San Joaquin River Storage to enhance the San Joaquin River restoration efforts and improve water supply reliability for agricultural, municipal and industrial, and environmental uses in the Friant Division, the San Joaquin Valley, and other regions of the state. The investigation will also evaluate integration of conjunctive management and water transfer concepts into project formulations. Additional storage is also expected to provide incidental flood damage reduction benefits.

Reclamation is analyzing alternatives for a new dam and a 1.26 million acre-foot reservoir at San Joaquin River Mile 274, in an area known as Temperance Flat. Primary planning objectives are to: 1) increase water supply reliability, and 2) enhance flow and temperature conditions to support the San Joaquin River Restoration Program. To the extent possible, the investigation will explore opportunities to provide other benefits that could include hydropower, flood control, and recreation. Operation variables include reservoir carryover, new or shifting water supply beneficiaries, and alternative conveyance routes. Operations alternatives evaluated in the draft Feasibility Report will be selected from combinations that most economically accomplish the planning objectives.

35.3.5.17 FERC Relicense Renewal for Turlock Irrigation District and Modesto Irrigation District Don Pedro Project

The Don Pedro Project is located on the Tuolumne River in Tuolumne County. The initial license was issued for operations between 1971 and 1991 followed by requirements to evaluate fisheries water needs in the Tuolumne River. In 1987, after the Turlock Irrigation District and Modesto Irrigation District applied to amend their license to add a fourth generating unit, FERC approved an amended fish study plan with possible changes in 1998. In 1996, FERC amended the license to implement amended minimum flow criteria and require fish monitoring studies for completion in 2005. In 2002, NMFS requested that FERC initiate formal consultation on the effects of the Don Pedro Project on Central Valley steelhead that were listed as threatened in 1998. FERC approved the Summary Report on fisheries in 2008. In 2009, NMFS, USFWS, CDFW, and several environmental interest groups filed requests for rehearing on the license. FERC denied portions of the request but required instream flow studies to be conducted and required NMFS to be included for consultation on any authorized changes to minimum flow release schedules. FERC also directed the appointment of an administrative law judge to assist in assessing the need for and feasibility for interim measures prior to relicensing. A final report was completed in 2010. Following the completion of the report and a monitoring plan by the affected districts, FERC approved an order modifying and approving instream flow and monitoring study plans. The initial license will expire in 2016. The objective of the relicensing process is to continue operation and maintenance of the Don Pedro Project facilities for electric power generation, along with implementation of any terms and conditions to be considered for inclusion in a new FERC hydroelectric license. The FERC relicensing procedures include an Endangered Species Act consultation by USFWS and NMFS.

35.3.5.18 FERC Relicense Renewal for Merced Irrigation District's Merced River Hydroelectric Project

The Merced River Hydroelectric Project is located on the Merced River in Mariposa County and includes both Lake McClure and McSwain Reservoir, two powerhouses (New Exchequer and McSwain), and recreation facilities. The initial FERC license will expire on February 28, 2014. The objective of the

relicensing process is to continue operation and maintenance of the Merced River Hydroelectric Project facilities for electric power generation, along with implementation of any terms and conditions to be considered for inclusion in a new FERC hydroelectric license. The FERC relicensing procedures include an Endangered Species Act consultation by USFWS and NMFS.

35.3.5.19 Grassland Bypass Project

The purposes and objectives of the proposed continuation of the Grassland Bypass Project, 2010–2019 are to: 1) extend the San Luis Drain Use Agreement in order to allow the Grassland Basin Drainers time to acquire funds and develop feasible drainwater treatment technology to meet revised Basin Plan objectives (amendment underway) and Waste Discharge Requirements by December 31, 2019; 2) continue the separation of unusable agricultural drainage water discharged from the Grassland Drainage Area from wetland water supply conveyance channels for the period 2010–2019; and 3) facilitate drainage management that maintains the viability of agriculture in the Project Area and promotes continuous improvement in water quality in the San Joaquin River. All discharges of drainage water from the Grassland Drainage Area into wetlands and refuges have been eliminated. The selenium load discharged from the Grassland Drainage Area has been reduced by 61 percent (from 9,600 lbs to 3,700 lbs) and the salt load has been reduced by 39 percent (from 187,300 tons to 113,600 tons). Prior to the project, the monthly mean concentration of selenium in Salt Slough was 16 parts per billion. Since October 1996, the concentration has been less than the water quality objective of two parts per billion. The drainage water is conveyed to Mud Slough. Grasslands Water District and others are currently evaluating alternative plans to comply with Central Valley RWQCB water quality objectives for selenium and salinity in the San Joaquin River at the end of this project in 2019. One of the alternatives could be zero discharge with complete recycle of the drainwater to salinity-tolerant crops.

35.3.5.20 Central Valley RWQCB Irrigated Lands Regulatory Program

The Irrigated Lands Regulatory Program regulates discharges from irrigated agricultural lands. Its purpose is to prevent agricultural discharges from impairing the waters that receive the discharges. The California Water Code authorizes the SWRCB and RWQCBs to conditionally waive waste discharge requirements if this is in the public interest. On this basis, the Los Angeles, Central Coast, Central Valley, and San Diego RWQCBs have issued conditional waivers of waste discharge requirements to growers that contain conditions requiring water quality monitoring of receiving waters. In 2010, the Central Valley RWQCB proposed to expand the requirements to groundwater especially for regulation of discharges with higher concentrations of nutrients. Participation in the waiver program is voluntary; however, non-participant dischargers must file a permit application as an individual discharger, stop discharging, or apply for coverage by joining an established coalition group. The waivers must include corrective actions when impairments are found.

35.3.5.21 Central Valley Salinity Alternatives for Long-term Sustainability

In 2006, the Central Valley RWQCB, the SWRCB, and stakeholders began a joint effort to address salinity and nitrate problems in California's Central Valley and adopt long-term solutions that will lead to enhanced water quality and economic sustainability. This effort is referred to as the Central Valley Salinity Alternatives for Long-term Sustainability (CV-SALTS) Initiative. The goal of CV-SALTS is to develop a comprehensive region-wide Salt and Nitrate Management Plan (SNMP) describing a water quality protection strategy that will be implemented through a mix of voluntary and regulatory efforts. The SNMP may include recommendations for numeric water quality objectives, beneficial use designation refinements, and/or other refinements, enhancements, or basin plan revisions. The SNMP will

serve as the basis for amendments to the three Basin Plans that cover the Central Valley Region (Sacramento River and San Joaquin River Basin Plan, the Tulare Lake Basin Plan, and the Sacramento/San Joaquin Rivers Bay-Delta Plan). The basin plan "amendments" will likely establish a comprehensive implementation plan to achieve water quality objectives for salinity (including nitrate) in the Region's surface waters and groundwater; and the SNMP may include recommendations for numeric water quality objectives, beneficial use designation refinements, and/or other refinements, enhancements, or basin plan revisions.

35.3.5.22 San Luis Reservoir Low Point Improvement Project

The San Luis Reservoir Low Point Improvement Project is proposed by Reclamation, the Santa Clara Valley Water District, and the San Luis and Delta Mendota Water Authority. As part of this project, Reclamation is investigating three alternatives to address the water quality problems within the CVP's San Felipe Division (Santa Clara and San Benito counties) that arise when San Luis Reservoir levels drop below 300,000 acre-feet during late summer in dry water years, resulting in large algal blooms. The alternatives being considered are to (1) expand the 6,000 acre-feet Pacheco Reservoir to 80,000 acre-feet or 130,000 acre-feet, (2) lower the San Felipe Intake at San Luis Reservoir, or (3) implement a combination comprehensive plan. The combination comprehensive plan would involve increasing groundwater recharge and recovery capacity, implementing desalination measures, re-operating Santa Clara Valley Water District's raw- and treated-water systems, and implementing institutional measures. If Pacheco Reservoir were to be enlarged, the reservoir would be filled with Delta water; thus, additional impacts on Delta aquatic species (e.g., juvenile salmonids and delta smelt) could result from an increase in Delta exports. The environmental scoping report for the San Luis Reservoir Low Point Improvement Project was released in January 2009 and the plan formulation report was published in January 2011.

35.3.5.23 San Luis Reservoir State Recreation Area Resource Management Plan/General Plan

The Resource Management Plan/General Plan for San Luis Reservoir, O'Neill Forebay, and Los Banos Creek Reservoir are being developed. State Parks manages the San Luis Reservoir State Recreation Area. Lands have been identified at O'Neill Forebay Wildife Area and San Luis Wildlife Area by Reclamation for management by CDFW. The Resource Management Plan/General Plan EIS/EIR evaluated three alternatives plus the No Action Alternative. One alternative would limit new access and development of the recreation areas. A second alternative would have moderate new access and recreation development. The third alternative would have the most new access and recreation development. The Revised Draft EIS/EIR was issued by Reclamation and State Parks in August 2012.

35.3.6 Ecosystem Improvement Projects and Actions in the Vicinity of Proposed NODOS Project facilities and/or Potentially Affected by SWP and CVP Operations (organized geographically from north to south)

The ecosystem improvement projects and actions in the vicinity of the proposed NODOS Project facilities and/or potentially affected by SWP and CVP operations considered in this cumulative impact assessment include:

- Trinity River Restoration Program
- Clear Creek Fisheries Habitat Restoration Program
- Clear Creek Mercury Abatement and Fisheries Restoration Project
- Iron Mountain Mine Superfund Site (on Spring Creek)

- Mainstem Sacramento River Gravel Augmentation Program
- Cottonwood Creek Geomorphological Analyses and Sediment Budget
- Cottonwood Creek Non-Native Invasive Species Eradication Program
- Mill Creek Riparian Assessment
- Deer Creek Irrigation District Dam Fish Passage Improvement and Flow Enhancement Project
- Yolo County Habitat/Natural Community Conservation Plan
- Yolo Bypass Wildlife Area Land Management Plan
- Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan
- Cache Slough Complex Restoration
- Lower Mokelumne River Spawning Habitat Improvement Project
- North Delta Flood Control and Ecosystem Restoration Project
- Fish Screen Project at Sherman and Twitchell Islands
- Dutch Slough Tidal Marsh Restoration
- Franks Tract Project
- Solano County Multi-species Habitat Conservation Plan
- Suisun Marsh Habitat Management, Preservation, and Restoration Plan Implementation
- San Joaquin River Restoration Program

35.3.6.1 Trinity River Restoration Program

Trinity River Restoration Program is conducted by eight partners that form the Trinity Management Council, including Reclamation, USFWS, NMFS, U.S. Forest Service, Hoopa Valley Tribe, Yurok Tribe, California Resources Agency, and Trinity County. The Trinity River Flow Evaluation Final Report was adopted in 1999 and the Trinity River Record of Decision (ROD) was signed in 2000 to implement restoration of the physical processes and rescale the Trinity River as foundation for fisheries recovery. The ROD described four restoration methods (flow management through releases from Lewiston Dam, construction of channel rehabilitation sites, augmentation of spawning gravels, and control of fine sediments); infrastructure improvements to accommodate high flow releases from Lewiston Dam; environmental compliance with improvements to riparian vegetation and wetlands, reduced turbidity, and improved water temperatures; and science-based adaptive management. The Trinity River Restoration Program 2011 Annual Report stated that approximately half of the projects described in the Flow Evaluation Study had been completed and intensive assessments of the physical responses of the Trinity River and geomorphic assessments of the 40-mile restoration reach had been initiated.

35.3.6.2 Clear Creek Fisheries Habitat Restoration Program

The Clear Creek fisheries habitat restoration is being implemented by USFWS and Reclamation in accordance with CVPIA actions (3406(b)(12). The restoration project's purpose is to support spring-run, fall-run, and late-fall-run Chinook salmon and steelhead, including improved flows for spawning, incubation, rearing, and outmigration; instream flow studies; removal of McCormick-Saeltzer Dam, improved fish passage, reduction in channel erosion, channel and floodplain restoration, gravel augmentation, and adaptive management with monitoring programs.

The Clear Creek Gravel Augmentation Program is part of the CVPIA actions to reduce impacts created by the construction and operation of Whiskeytown Dam. Whiskeytown Dam blocks gravel from moving downstream into the areas of Clear Creek where salmonids spawn. The injection of spawning-sized gravel will maintain quality spawning habitat for the production of salmonids. By the year 2020 the overall goal is to provide 347,288 square feet of usable spawning habitat between Whiskeytown Dam downstream to

the former McCormick-Saeltzer Dam, the amount that existed before construction of Whiskeytown Dam. Between 1996 and 2009, a total of approximately 130,925 tons of spawning gravel was added to the creek. The programs' interim annual spawning gravel addition target is 25,000 tons per year, but due to a lack of funding, only an average of 9,358 tons has been placed annually since 1996.

In 2010, the first annual evaluation of spawning gravel implementation and monitoring was submitted to NMFS as a requirement under the 2009 Biological Opinion. In 2012, Reclamation prepared a Categorical Exclusion Checklist to place 10,000 tons of spawning gravel at four locations: Guardian Rock/Below N.E.E.D. Camp, Placer Bridge, Clear Creek Crossing/Bridge, and Tule Backwater.

35.3.6.3 Clear Creek Mercury Abatement and Fisheries Restoration Project

The Lower Clear Creek Aquatic Habitat and Waste Discharge Improvement Project was initiated to remove the long-term impacts of mercury contamination in Lower Clear Creek and to create over five acres of new wetlands. The mercury sources are dredge-mined tailings from more than 200 historic gold and gravel mines in the watershed. The tailings are located on the properties adjacent to Clear Creek and in gravels historically used for spawning gravel supplementation. This is being completed in accordance with CVPIA actions. One of the first projects was the removal of the McCormick-Saeltzer Dam in 2000, which had blocked fish passage to upper Clear Creek. Other projects include gravel augmentation of over 10,000 tons of gravel (as described below), revegetation of some parts of the channel, monitoring, and modeling,

35.3.6.4 Iron Mountain Mine Superfund Site

The Iron Mountain Mine Superfund Site on Spring Creek had discharged acid mine drainage into several creeks that are tributary to Keswick Reservoir and the Sacramento River since the late 1890s. The interim remedies include source control, acid mine drainage collection and treatment, and water management, including water diversions and coordinated releases of contaminated surface water from Spring Creek Debris Dam with dilution flows released from Shasta Lake. In 2008, the U.S. Environmental Protection Agency indicated that the interim remedies were operational and had reduced metal loading discharges by 95 percent as compared to pre-project conditions. A final restoration plan for natural resources injuries due to Iron Mountain Mine was adopted in 2002 by USFWS, CDFW, National Oceanic and Atmospheric Administration, U.S. Bureau of Land Management, and Reclamation, and those programs are being implemented.

35.3.6.5 Mainstem Sacramento River Gravel Augmentation Program

The Mainstem Sacramento Gravel Augmentation Program is an ongoing Reclamation project that helps meet requirements of Section 3406 (b)(13) of the CVPIA to restore and replenish spawning gravel and rearing habitat for salmonid species.

Reclamation began placing salmonid spawning gravel in the Sacramento River approximately 0.25 miles downstream of Keswick Dam in August 2011. The project will place approximately 5,000 tons/year of gravel into the river to help improve spawning habitat for Chinook salmon and steelhead.

35.3.6.6 Cottonwood Creek Geomorphological Analyses and Sediment Budget

Severe streambank erosion along the main channels of Cottonwood Creek, particularly in the lower watershed, is prompting landowners to implement piecemeal "emergency" responses, which can include significant bank armoring and may cause new problems or exacerbate existing problems elsewhere along

the channel. As a result, a coordinated stream restoration/management effort that emphasizes watershed-wide processes and is supported by the most recent geomorphic analyses tools is needed. To meet this need, the Cottonwood Creek Geomorphological Analyses and Sediment Budget goal is to develop a sediment budget for Cottonwood Creek based upon geomorphological data from 1939 to present; quantify spatial and temporal characteristics of sediment supply, storage, and transport in the system, and to identify the effects of sediment transport dynamics on perceived channel and watershed changes. The project will include the collection of needed additional data; and synthesis of currently available data to complete the sediment budget and answer the questions posed below.

A comprehensive synthesis of previously existing and supplemental data would be conducted incorporating the most current geomorphic analysis methods. The interpretation would call on cross-disciplinary expertise and will target specific questions of practical interest to local stakeholders such as: 1) How "stable" is the stream channel given historic and current natural conditions and land management?; 2) What roles do in-channel islands play and how might the practice of moving these islands affect the upstream and downstream channel and habitat conditions?; 3) Is current channel configuration a limiting factor to aquatic or terrestrial organisms of concern?; 4) Is the channel instability due to the amount of aggregate being removed by gravel mining?; and 5) Are current land use practices affecting the sediment budget in such a way as to create channel instability, and if so, how? The main concern is the channel instability of the lower watershed and how the bed material budget may be affecting channel response to differing flow events.

The Cottonwood Creek Working Group (CCWG) is working with Graham Matthews & Associates to insert three separate gages into the Cottonwood Creek system. Other portions of the creek will have sporadic samples taken to also assist with the project. The first gage went into the creek in January 2010.

35.3.6.7 Cottonwood Creek Non-Native Invasive Species Eradication Program

The Cottonwood Creek Non-Native Invasive Species Eradication Program is part of the Anadromous Fish Restoration Program (AFRP) and is being administered by the CCWG. The Nonnative Invasive Plant Management and Control Project was funded in Fiscal Year 2009 to complete the environmental compliance documents and permitting to eradicate non-native noxious and invasive (NIS) plants within the riparian corridor of Cottonwood Creek. Non-native plant inventories of the targeted species were completed this year to assist with the NEPA effects analysis.

35.3.6.8 Mill Creek Riparian Assessment

The need to restore and maintain riparian habitat in Mill Creek is identified by AFRP and in the CALFED ERP goals, objectives, and targets. The AFRP is one of five CVPIA programs that has been integrated with the ERP. Both of these programs prioritize establishment, restoration, and maintenance of anadromous fish habitat on this stream, particularly in the arena of riparian habitat and flow enhancement. In response to this identified need, Reclamation and USFWS are implementing the Mill Creek Riparian Assessment. The project includes: 1) riparian habitat and condition mapping and vegetation classification of the Mill Creek watershed, 2) identifying and prioritizing areas that should be restored, enhanced, and/or preserved in addition to existing conservation easements, and 3) identifying the types of restoration actions that should occur at the prioritized sites.

35.3.6.9 Deer Creek Irrigation District Dam Fish Passage Improvement and Flow Enhancement Project

Deer Creek, in Tehama County, features unique habitat that makes it a very important resource for anadromous fish in the Sacramento Valley. There are three diversion dams and four screened diversion ditches in Deer Creek. Inadequate flow for upstream passage is the most significant problem in Deer Creek. The Deer Creek Irrigation District (DCID) Dam is the uppermost dam on Deer Creek. The DCID Dam is a flashboard dam with a screened diversion. During the floods in 1997, portions of this structure were damaged, creating fish passage issues.

DWR staff is monitoring the upstream and downstream stage differential at the DCID Dam. Work is also underway by DCID, DWR, and CDFW to develop an environmental flow enhancement program in lower Deer Creek. The goal of the enhancement program is to increase fish transportation flows downstream of the DCID Dam. There are over 25 miles of prime spawning habitat upstream of the DCID Dam. DWR's Fish Passage Improvement Program (FPIP) and Northern Region staff are completing the detailed topographic survey of the area and preliminary engineering investigation.

In August 2007, DCID, DWR's Northern Region Office, and CDFW signed a Memorandum of Agreement (Agreement) for the construction, operation, maintenance and monitoring of a flow enhancement program on Deer Creek. DCID recognizes the need for a long-term solution to the fish transportation issues in Deer Creek and has continued to work with the DWR, Deer Creek Watershed Conservancy, Tehama County, CDFW, and NMFS. A Conceptual Framework for the Deer Creek Flow Enhancement Program was developed by DWR. This framework was designed to fulfill the water needs of local agricultural and domestic water users, while achieving the fisheries water flow objectives in Deer Creek.

35.3.6.10 Yolo County Habitat/Natural Community Conservation Plan

The Yolo County Habitat Joint Powers Authority, consisting of five local public agencies, launched the Yolo Natural Heritage Program in March 2007. This effort includes the continuing preparation of a joint HCP/NCCP. Member agencies include Yolo County and the Cities of Davis, Woodland, West Sacramento, and Winters.

The HCP/NCCP describes the measures that local agencies will implement in order to conserve biological resources, obtain permits for urban growth and public infrastructure projects, and continue to maintain the agricultural heritage and productivity of Yolo County. The nearly 653,820-acre planning area provides habitat for covered species occurring within five dominant habitats/natural communities. The plan proposes to address 63 covered species, including seven state-listed species: palmate-bracted bird's-beak, Colusa grass, Crampton's tuctoria, giant garter snake, Swainson's hawk, western yellow-billed cuckoo, and bank swallow. Interim conservation activities include acquiring permanent conservation easements for sensitive species habitat in the plan area.

35.3.6.11 Yolo Bypass Wildlife Area Land Management Plan

The Yolo Bypass Wildlife Area consists of approximately 16,770 acres of managed wildlife habitat and agricultural land within the Yolo Bypass. The bypass conveys seasonal high flows from the Sacramento River to help control river stage and protect the cities of Sacramento, West Sacramento, and Davis, as well as other local communities, farms, and lands from flooding. Substantial environmental, social, and economic benefits are provided by the Yolo Bypass, benefiting the people of the State of California.

The stated purposes of the Yolo Bypass Wildlife Area Land Management Plan are to: (1) guide the management of habitats, species, appropriate public use, and programs to achieve CDFW's mission; (2) direct an ecosystem approach to managing the Yolo Bypass Wildlife Area in coordination with the objectives of the CALFED ERP; (3) identify and guide appropriate, compatible, public-use opportunities within the Yolo Bypass Wildlife Area; (4) direct the management of the Yolo Bypass Wildlife Area in a manner that promotes cooperative relationships with adjoining private-property owners; (5) establish a descriptive inventory of the sites and the wildlife and plant resources that occur in the Yolo Bypass Wildlife Area; (6) provide an overview of the Yolo Bypass Wildlife Area's operation, maintenance, and personnel requirements to implement management goals, and serve as a planning aid for preparation of the annual budget for the Bay- Delta Region (Region 3); and (7) present the environmental documentation necessary for compliance with State and federal statutes and regulations, provide a description of potential and actual environmental impacts that may occur during plan management, and identify mitigation measures to avoid or lessen these impacts.

35.3.6.12 Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan

The Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan is being prepared jointly by DWR and Reclamation to address Reasonable and Prudent Alternative (RPA) Actions I.6.1 and I.7 of the 2009 NMFS Biological Opinion to restore floodplain rearing habitat and reduce migratory delays and loss of salmon, steelhead, and sturgeon in the Yolo Bypass. The implementation plan describes the objectives and performance measures for these actions and potential actions for further evaluation. The implementation plan was submitted to NMFS in September 2012 for concurrence of the plan and for the initiation of environmental documentation. The NMFS concurred with the implementation plan in November 2012. The environmental documentation is currently being completed.

35.3.6.13 Cache Slough Complex Restoration

The Cache Slough Complex is located in the northern Delta where Cache Slough and the southern Yolo Bypass meet. It currently includes Liberty Island, Little Holland Tract, Prospect Island, Little Egbert Tract and the surrounding waterways. Levee height on these tracts is restricted and designed to allow overtopping in large flow events to convey water from the upper Yolo Bypass. Since 1983 and 1998 respectively, Little Holland Tract and Liberty Island have remained breached. Restoration is occurring naturally on the islands. Restoration in the Cache Slough Complex was identified as an Interim Delta Action by Governor Schwarzenegger in July 2007.

The Cache Slough Complex has potential for restoration success because of its relatively high tidal range, historic dendritic channel network, minimal subsidence, and remnant riparian and vernal pool habitat. Restoration efforts would support native species, including delta smelt, longfin smelt, Sacramento splittail, and Chinook salmon, by creating or enhancing natural habitats and improving the food web fish require. Surrounding lands that are at elevations that would function as floodplain or marsh if not separated by levees could also be included in the Cache Slough Area. This broader area includes roughly 45,000 acres of existing and potential open water, marsh, floodplain, and riparian habitat. The goals of restoration in the Cache Slough Complex are to: 1) re-establish natural ecological processes and habitats to benefit native species, 2) contribute to scientific understanding of restoration ecology, and 3) maintain or improve flood safety. Three restoration actions are being considered in the Cache Slough Complex, including restoration actions at Calhoun Cut, Little Holland Tract, and Prospect Island.

35.3.6.14 Lower Mokelumne River Spawning Habitat Improvement Project

The Mokelumne River is tributary to the Delta and supports five species of anadromous fish. The proposed project would initially place 4,000 to 5,000 cubic yards of suitably sized salmonid spawning gravel annually for a three-year period at two specific sites, and then provide annual supplementation of 600 to 1,000 cubic yards thereafter. Fall-run Chinook salmon and steelhead are the primary management focus in the river. Availability of spawning gravel in this section of the Mokelumne River has been determined to be deficient because historic gold and aggregate mining operations removed gravel annually and upstream dams have reduced gravel transport to the area. This area was chosen because it is known to have supported fall-run Chinook salmon and steelhead spawning in the past and because the substrate is suitable for habitat improvement.

35.3.6.15 North Delta Flood Control and Ecosystem Restoration Project

The North Delta Flood Control and Ecosystem Restoration Project is proposed near the confluence of the Cosumnes and Mokelumne rivers by DWR and encompasses approximately 197 square miles. Consistent with objectives contained in the CALFED ROD, the project is intended to improve flood management and provide ecosystem benefits in the North Delta area through actions such as construction of setback levees and configuration of flood bypass areas to create quality habitat for species of concern. These actions are focused on McCormack-Williamson Tract and Staten Island. The project would implement flood control improvements in a manner that benefits aquatic and terrestrial habitats, species, and ecological processes. Flood control improvements are needed to reduce damage to land uses, infrastructure, and the Bay-Delta ecosystem resulting from overflows caused by insufficient channel capacities and catastrophic levee failures in the 197 square-mile project study area.

The proposed project as described in the Final EIR included: levee modifications to allow controlled flow across McCormack-Williamson Tract and to mitigate hydraulic impacts; channel dredging to increase flood conveyance capacity; an off-channel detention basin on Staten Island; ecosystem restoration where floodplain forests and marshes would be developed at McCormack-Williamson Tract and the Grizzly Slough property; setback levee on Staten Island to expand the floodway conveyance; opening up the southern portion of McCormack-Williamson Tract to boating; improving the Delta Meadows property; providing access and interpretive kiosks for wildlife viewing; and providing restroom, circulation, parking, and signage infrastructure to support such uses.

35.3.6.16 Fish Screen Project at Sherman and Twitchell Islands

The Fish Screen Project south of Rio Vista is proposed by CDFW and involves installing fish screens on up to 10 unscreened agricultural intakes used to irrigate State-owned lands on Sherman and Twitchell islands in the Delta. The project is intended to contribute to the protection of delta smelt and other sensitive aquatic species and the restoration of habitat in the Delta.

35.3.6.17 Dutch Slough Tidal Marsh Restoration

The Dutch Slough Tidal Marsh Restoration Project, located near Oakley in Eastern Contra Costa County, would restore wetland and uplands and provide public access to the 1,200-acre Dutch Slough property. The property is composed of three parcels separated by narrow man-made sloughs. The project is a cooperative partnership between DWR, the California Coastal Conservancy, CDFW, the City of Oakley, the Ironhouse Sanitary District, Reclamation Districts 2137 and 799, the Natural Heritage Institute, and landowners. The project will provide ecosystem benefits, including habitat for sensitive species such as winter-run Chinook salmon, Sacramento splittail, and many waterfowl species. It also would be designed

and implemented to maximize opportunities to assess the development of those habitats and measure ecosystem responses so that future Delta restoration projects will be more successful. DWR approved the Final EIR for the project in March 2010.

35.3.6.18 Franks Tract Project

DWR and Reclamation are conducting studies to evaluate the feasibility of modifying the hydrodynamic conditions near Franks Tract to improve Delta water quality and enhance the aquatic ecosystem. The results of these studies have indicated that modifying the hydrodynamic conditions near Franks Tract may substantially reduce salinity in the Delta and protect fishery resources, including populations of delta smelt, a federally listed and State-listed species that is endemic to the Delta. As a result, DWR and Reclamation propose to implement the Franks Tract Project to improve water quality and fisheries conditions in the Delta. DWR and Reclamation are evaluating the installation of operable gates to control the flow of water at key locations (Threemile Slough and/or West False River) to reduce sea water intrusion, and to positively influence movement of fish species of concern to areas that provide favorable habitat conditions. The project gates would be operated seasonally and during certain hours of the day, depending on fisheries and tidal conditions. Boat passage facilities would be included to allow for passing of watercraft when the gates are in operation. The Franks Tract Project is consistent with ongoing planning efforts for the Delta to help balance competing uses and create a more sustainable system for the future. By protecting fish resources, this project also could improve operational reliability of the SWP and CVP because curtailments in water exports (pumping restrictions) are likely to be less frequent. Franks Tract was previously evaluated as part of DWR's Flooded Island Pre-Feasibility Study Report.

35.3.6.19 Solano County Multi-species Habitat Conservation Plan

The Solano HCP is intended to support the issuance of an incidental take permit under the federal Endangered Species Act for a period of 30 years. This permit is required for the Solano Project Contract Renewal Biological Opinion between USFWS and Reclamation. The scope of the Solano HCP was expanded beyond the requirements of the Biological Opinion to include additional voluntary applicants and additional species for incidental take coverage. These additional species include federally listed fish species under the jurisdiction of NMFS and species listed as threatened or endangered under the California Endangered Species Act. The HCP further addresses other species of concern (i.e., species recognized by groups such as the CDFW and the California Native Plant Society as having declining or vulnerable populations, but not officially listed as threatened or endangered species). Thirty-seven species are proposed to be covered under the Solano HCP. The minimum geographical area to be covered is the Solano County Water Agency's contract service area that includes the cities of Fairfield, Vacaville, Vallejo, Suisun City, the Solano Irrigation District, and the Maine Prairie Water District. The area covered by the HCP includes all of Solano County and a small portion of Yolo County. The HCP includes a Coastal Marsh Natural Community Conservation Strategy designed to maintain the water and sediment quality standards, hydrology, and ecological functions of this natural community; contribute to the restoration of tidally influenced coastal marsh habitat; contribute to the conservation and recovery of associated covered species; and promote habitat connectivity. Primary conservation actions include preservation (primarily through avoidance), restoration, invasive species control, and improvement of water quality. The plan area covers 580,000 acres, which includes 12,000 acres of proposed development and 30,000 acres that will be preserved.

35.3.6.20 Suisun Marsh Habitat Management, Preservation, and Restoration Plan Implementation

On March 2, 1987, the Suisun Marsh Preservation Agreement was signed by DWR, CDFW, Reclamation, and the Suisun Resource Conservation District. The purpose of the agreement was to establish mitigation for impacts on salinity from the SWP, CVP, and other upstream diversions.

In 2001, USFWS, Reclamation, CDFW, DWR, NMFS, the Suisun Resource Conservation District, and CALFED (the Principal Agencies) directed the formation of a charter group to develop a plan for Suisun Marsh that would balance the needs of CALFED, the Suisun Marsh Preservation Agreement, and other plans by protecting and enhancing existing land uses, existing waterfowl and wildlife values including those associated with the Pacific Flyway, endangered species, and State and federal water project supply quality. In addition to the Principal Agencies, the charter group included other regulatory agencies such as USACE, the San Francisco Bay Conservation and Development Commission, SWRCB, and RWQCBs. In 2011, the Principal Agencies published a Final EIS/EIR for the Suisun Habitat Management, Preservation, and Restoration Plan. The plan purposes/objectives are:

- Habitats and Ecological Processes to implement CALFED Ecosystem Restoration Program Plan
- Public and Private Land Use to maintain the heritage of waterfowl hunting and other recreational opportunities and increase the surrounding communities' awareness of the ecological values of Suisun Marsh
- Levee System Integrity to protect property, infrastructure, and wildlife habitats from catastrophic flooding
- Water Quality to protect, and where possible, improve water quality for beneficial uses in Suisun Marsh

The proposed project will restore 5,000 to 7,000 acres of tidal marsh and provide protection and enhancement of 40,000 to 46,000 acres of managed wetlands. The plan includes environmental commitments and mitigation measures, adaptive management programs, and reporting through annual reports over the 30-year time frame of the plan.

35.3.6.21 San Joaquin River Restoration Program

The San Joaquin River Restoration Program is a comprehensive long-term effort to restore flows to the San Joaquin River from Friant Dam to the confluence of Merced River and restore a self-sustaining Chinook salmon fishery in the river while reducing or avoiding adverse water supply impacts from restoration flows. The restoration program is the product of more than 18 years of litigation, which culminated in a Stipulation of Settlement on the lawsuit known as Natural Resources Defense Council (NRDC), et al., v. Kirk Rodgers, et al. The settling parties reached agreement on the terms and conditions of the settlement, which was subsequently approved by Federal Court on October 23, 2006. The settling parties include the NRDC, Friant Water Users Authority, and the U.S. Departments of the Interior and Commerce. The settlement's two primary goals are to:

- Restore and maintain fish populations in "good condition" in the main stem of the San Joaquin River below Friant Dam to the confluence of the Merced River, including naturally reproducing and self-sustaining populations of salmon and other fish, and

- Reduce or avoid adverse water supply impacts to all of the Friant Division long-term contractors that may result from the Interim Flows and Restoration Flows provided for in the settlement.

The settlement requires specific releases of water from Friant Dam to the confluence of the Merced River, which are designed primarily to meet the various life stage needs for spring- and fall-run Chinook salmon. The release schedule assumes continuation of the current average Friant Dam release of 116,741 acre-feet, with additional flow requirements depending on the year type. The project was authorized and funded with the passage of the San Joaquin River Restoration Settlement Act, part of the Omnibus Public Land Management Act of 2009 (Public Law 111-11). Interim flows began in October, 2009. There are many physical improvements within and near the San Joaquin River that will be undertaken to fully achieve the river restoration goal. The improvements will occur in two separate phases that will focus on a combination of water releases from Friant Dam, as well as structural and channel improvements.

35.4 Cumulative Effects Analysis by Resource

The potential for implementation of the range of alternatives evaluated in this DEIR/EIS to result in a cumulatively considerable incremental contribution was determined for each resource based upon the significance criteria for each resource, as described in Chapters 6 through 31. To reduce any cumulatively considerable incremental contributions from the NODOS Project action alternatives to an overall cumulative effect, feasible mitigation measures are proposed for all potentially substantial direct and indirect effects. In some cases, no feasible mitigation could be applied to reduce effects. In these cases, the cumulative effects are considered to be substantial and unavoidable.

35.4.1 Surface Water Resources

In Chapter 6 Surface Water Resources, changes in surface water resources are described but not assessed or evaluated to determine the significance of surface water resources changes. Impact and significance determinations that rely on the surface water resources data that are presented in Chapter 6 Surface Water Resources are described and evaluated in other resource chapters (e.g., changes in reservoir storage and river flows could affect recreation resources). Therefore, the cumulative analysis of surface water resources does not provide an assessment of significance.

Alternatives A, B, and C would be integrated with the CVP and SWP systems, and would affect CVP and SWP operations, reservoir storage, river flows downstream of the reservoirs, Delta outflow, and water supply deliveries. The alternatives were developed to improve cold water pool management in Trinity Lake, Shasta Lake, Lake Oroville, Folsom Lake, and the Sacramento River in drier years; increase Delta exports and SWP allocations in drier years; improve Delta water quality for municipal and industrial water users in the Delta and south of Delta, especially in summer and fall of most years, and for enhancement of aquatic resources through X2 location criteria; and stabilize Sacramento River flows to improve spawning and rearing conditions in most years. Major differences between Alternatives A, B, and C are related to the size of the proposed Sites Reservoir and the inclusion of the proposed Delevan Pipeline Intake Facilities. These differences would affect diversion patterns from the Sacramento River into the proposed Sites Reservoir, and release patterns from CVP and SWP reservoirs to provide for or respond to the operations of Sites Reservoir.

When combined with other past, present, and reasonably foreseeable future projects, there could be changes in operations of CVP and SWP facilities and related changes in reservoir storage, river flows downstream of the reservoirs, and CVP and SWP water supply deliveries under Alternatives A, B, or C.

The quantitative analysis of surface water conditions under Alternatives A, B, or C presented in Chapter 6 Surface Water Resources included conditions under past, present, and future projects under the No Project/No Action Alternative. Implementation of other reasonably foreseeable projects included in the cumulative effects analysis that are less defined than future projects under the No Project/No Action Alternative also could change CVP and/or SWP reservoir operations to meet downstream minimum instream flows or water quality objectives. The changes in operations also could change available water supplies and related CVP and SWP water deliveries. The changes could occur in three different ways:

- **Future projects that could affect overall CVP and SWP water supply operations.** These projects could result in changes to minimum instream flow in rivers affected by CVP and SWP operation, Delta outflow criteria to maintain flow and/or salinity (e.g., X2 location), reverse flow criteria for Old and Middle rivers, and diversion criteria at the south Delta intakes. Future projects which could change these criteria include the SWRCB Bay-Delta Water Quality Plan Update, Bay Delta Conservation Plan, NMFS recovery plan for salmonids, USFWS recovery plan of delta smelt, and Shasta Lake Water Resources Investigation. However, the changes associated with the future projects would be complimentary with many of the changes associated with the proposed Project because they also would encourage improved cold water management, decreased Delta salinity, and improved spawning and rearing conditions. It is possible that the future projects in addition to this proposed Project could result in reductions in CVP and SWP exports.
- **Future projects that could change inflow patterns to CVP and SWP reservoirs or the Delta.** In response to future projects that change inflows to the reservoirs or the Delta, the CVP and SWP may need to change operations to maintain compliance with flow and water quality. These changes could result in less water available for diversion to the proposed Sites Reservoir or for CVP and SWP water deliveries. It should be noted that the No Project/No Action Alternative and Alternatives A, B, and C include an assumption that water demands in the Sacramento Valley would increase by approximately 500,000 acre-feet/year. Future projects not included in the No Project/No Action Alternative would either increase the water demand further or change the diversion pattern throughout the year. The Woodland-Davis Water Supply Project and El Dorado Water and Power Authority Supplemental Water Rights Project could reduce Sacramento River flows downstream of the City of Sacramento in some months due to an increase in diversions for these regional water supplies. The EBMUD Camanche Water Rights Permit Extension, Semitropic Water Storage District Delta Wetlands, Los Vaqueros Reservoir Expansion Phase II, and Upper San Joaquin River Basin Storage Investigation could change flow patterns in the Delta.
- **Future projects that could increase flexibility in water demand patterns.** Water users that expand their water supply portfolio may have more flexibility to change the historical patterns of CVP and SWP water deliveries. For example, water users that have diverted water during the summer months for irrigation could change their delivery patterns to other months if the water was diverted for groundwater recharge. The water user would then use groundwater during the irrigation season. Future projects that may be able to increase flexibility in water demand patterns include the EBMUD Water Supply Management Program 2040, Eastern San Joaquin Integrated Conjunctive Use Program, and the Bay Area Regional Desalination Project.

35.4.2 Surface Water Quality

Water quality degradation does exist in the Central Valley streams when considering past and present conditions. As described in Chapter 7 Surface Water Quality, the No Project/No Action Alternative would not result in substantial adverse effects to surface water quality as compared to Existing Conditions.

Several factors related to future projects evaluated in the cumulative effects analysis could affect water quality in the Extended Study Area (regions south of the Delta where Delta exports are used) and the Secondary Study Area (waterbodies that could be affected by proposed Project operations). None of the future projects evaluated in the cumulative effects analysis would result in construction projects within the Primary Study Area (area where the proposed Project storage and conveyance facilities would be constructed).

35.4.2.1 Alternative A

Extended Study Area and Secondary Study Area

Alternative A was developed to improve cold water management and Delta water quality, and to stabilize flows downstream of the CVP and SWP reservoirs. These actions would result in either no change or improvements to surface water quality including salinity, bromides, and chlorides in the Delta; and metals, sediment, nutrients, and other constituents, including mercury, in the waterbodies affected by proposed Project operations.

Alternative A also would result in changes in the operation of San Luis Reservoir to reduce the potential for algal blooms and associated water quality degradation. The associated water quality improvement under Alternative A and water quality improvement under the future San Luis Reservoir Low Point Improvement Project would result in improved water quality for users of water from San Luis Reservoir.

Implementation of projects considered under the cumulative effects assessment that could result in changes in CVP and SWP operation (including the implementation of CVPIA and CALFED, SWRCB Bay-Delta Water Quality Plan Update, Bay Delta Conservation Plan, NMFS recovery plan for salmonids, USFWS recovery plan of delta smelt, and Shasta Lake Water Resources Investigation) generally are being developed to improve water quality. Other future projects also are being considered to improve water quality in the San Joaquin River and the Delta, including the continuation of the South Delta Temporary Barriers Operations, Franks Tract Project, Stockton Deep Water Ship Channel Dissolved Oxygen Project, Grassland Bypass Project, San Luis Reservoir Low Point Improvement Project, Central Valley Irrigated Lands Regulatory Program, CV-SALTS, and San Joaquin River Restoration Program. Implementation of Alternative A and these future projects that are being considered to improve water quality would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on surface water quality, and could result in cumulatively beneficial effects.

Implementation of projects that could result in increased amounts of wetland habitat that would be subject to periodic inundation and drying cycles could result in increased water quality degradation due to sediment and methylmercury. As described in Chapter 7 Surface Water Quality, Alternative A would not result in substantial adverse effects from increased contributions of mercury from upstream sources due to changes in flow patterns on the Sacramento and Feather rivers; and would not include expansion of ecosystem restoration areas that would contribute to methylmercury water quality degradation. Future projects considered in the cumulative effects analysis could contribute to mercury water quality issues, including the Bay Delta Conservation Plan, Delta Plan, Regional Advanced Mitigation Program, Clear Creek Mercury Abatement and Fisheries Restoration Project, Iron Mountain Mine Superfund Site, Yolo

County Habitat/Natural Community Conservation Plan, Yolo Bypass Wildlife Area Land Management Plan, Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan, and Cache Slough Complex Restoration. Other future projects could be operated in a manner to avoid mercury water quality issues, including the Dutch Slough Tidal Marsh Restoration and the Suisun Marsh Habitat, Management, Preservation, and Restoration Plan Implementation.

Because Alternative A would improve cold water management and Delta water quality, and would not contribute to the mercury concentrations in the Delta, implementation of Alternative A and the identified future projects would not result in a cumulatively considerable incremental contribution to an overall substantial adverse cumulative effect on surface water quality in the Extended Study Area and Secondary Study Area.

Primary Study Area

Without mitigation, Alternative A could have potentially substantial effects on water quality in the Primary Study Area. These effects could be caused by temporary or short-term construction-related activities that cause sediment, petroleum, or other substances to enter the waterways in runoff. As described in Chapter 7 Surface Water Quality, mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation or maintenance activities within the Primary Study Area. Therefore, implementation of Alternative A and the identified future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on surface water quality.

35.4.2.2 Alternative B

Extended Study Area and Secondary Study Area

As described in Chapter 7 Surface Water Quality, water quality effects from implementation of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. The cumulative effects of Alternative B would therefore be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on surface water quality in the Extended Study Area and Secondary Study Area.

Primary Study Area

Water quality effects in the Primary Study Area under Alternative B would be different than under Alternative A due to the increased size of the proposed Sites Reservoir. Without mitigation, Alternative B could have potentially substantial adverse effects on water quality in the Primary Study Area. These effects could be caused by temporary or short-term construction-related activities that cause sediment, petroleum, or other substances to enter the waterways in runoff. As described in Chapter 7 Surface Water Quality, mitigation measures would eliminate or reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative B and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on surface water quality in the Primary Study Area.

35.4.2.3 Alternative C

Extended Study Area and Secondary Study Area

As described in Chapter 7 Surface Water Quality, water quality effects from implementation of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. The cumulative effects of Alternative C would therefore be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on surface water quality in the Extended Study Area and Secondary Study Area.

Primary Study Area

Water quality effects in the Primary Study Area under Alternative C would be different than under Alternative A due to the increased size of the proposed Sites Reservoir. Without mitigation, Alternative C could have potentially substantial effects on water quality in the Primary Study Area. These effects could be caused by temporary or short-term construction-related activities that cause sediment, petroleum, or other substances to enter the waterways in runoff. As described in Chapter 7 Surface Water Quality, mitigation measures would eliminate or reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative C and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on surface water quality in the Primary Study Area.

35.4.3 Fluvial Geomorphology and Riparian Habitat

Fluvial geomorphologic changes are occurring in the Central Valley streams that alter natural river processes including bank erosion, sediment transport, and changes in river sinuosity and river bed dimensions. As described in Chapter 8 Fluvial Geomporphology and Riparian Habitat, the No Project/No Action Alternative would not result in substantial adverse effects to fluvial geomorphologic conditions as compared to Existing Conditions.

Future projects evaluated in the cumulative effects analysis could affect fluvial geomorphologic conditions in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area.

35.4.3.1 Alternative A

Extended Study Area and Secondary Study Area

As described in Chapter 8 Fluvial Geomporphology and Riparian Habitat, the amount of alteration to natural river processes and characteristics associated with implementation of Alternative A in the Extended Study Area and Secondary Study Area would be minor as compared to Existing Conditions and the No Project/No Action Alternative because the hydraulic changes would not substantially change flood flows, which is when most geomorphic effects occur. The effects would not be substantial. Changes in sediment transport and local flow patterns near the intakes under Alternative A are not anticipated to affect sediment concentration in the Sacramento River, and therefore, would not have a substantial effect on sediment concentration, turbidity, and water clarity. Alternative A also is not anticipated to result in substantial adverse effects on natural river meandering, bank erosion, large woody debris occurrence,

riparian aquatic habitat, and spawning gravel conditions as compared to Existing Conditions and the No Project/ No Action Alternative.

Implementation of projects considered under the cumulative effects assessment that could result in changes in CVP and SWP operation (including the SWRCB Bay-Delta Water Quality Plan Update, Bay Delta Conservation Plan, NMFS recovery plan for salmonids, USFWS recovery plan of delta smelt, Butte County Regional Conservation Plan, and Shasta Lake Water Resources Investigation) generally are being developed to improve flow regimes in the Sacramento, Feather, and American rivers. However, implementation of some projects, including the Trinity River Restoration Program, Mainstem Sacramento River Gravel Augmentation Program, Cottonwood Creek Geomorphological Analyses and Sediment Budget, Cache Slough Complex Restoration, North Delta Flood Control and Ecosystem Restoration Project, Dutch Slough Tidal Marsh Restoration, Franks Tract Project, and San Joaquin River Restoration Program, could result in changes to fluvial geomorphologic conditions that would include both beneficial effects, such as beneficial effects due to Cottonwood Creek Geomorphological Analysis and Sediment Budget, and potentially locally substantial adverse effects. However, the local effects could be reduced after implementation of mitigation measures similar to measures described in Chapter 8 Fluvial Geomporphology and Riparian Habitat to reduce fluvial geomorphologic effects.

Implementation of projects that could result in increased amounts of wetland habitat that would be subject to periodic inundation and drying cycles could result in changes in sediment transport and deposition in the Delta, Suisun Bay, San Pablo Bay, and San Francisco Bay. These effects could be potentially substantial and would occur without implementation of Alternative A. Alternative A would not contribute to the changes in sediment transport and deposition. Therefore, implementation of Alternative A and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on fluvial geomorphologic conditions in the Extended Study Area or Secondary Study Area.

Primary Study Area

As described in Chapter 8 Fluvial Geomporphology and Riparian Habitat, alteration to natural river processes and characteristics in the Primary Study Area would not occur at the proposed Delevan Pipeline Intake Facilities location due to local geology and existing upstream bank protection; the fish screen would also stabilize a portion of the river bank. Local removal of riparian vegetation at the proposed intake location also would not result in a substantial adverse effect on habitat complexity in the Sacramento River. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative A and the identified future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on fluvial geomorphologic conditions.

35.4.3.2 Alternative B

Extended Study Area and Secondary Study Area

As described in Chapter 8 Fluvial Geomporphology and Riparian Habitat, the fluvial geomorphologic effects of implementation of Alternative B would be similar to those described for Alternative A in the Extended Study Area and most of the Secondary Study Area. Fluvial geomorphologic effects in parts of the Secondary Study Area along the Sacramento River under Alternative B would be different than under Alternative A due to the increased size of the proposed Sites Reservoir. However, the amount of alteration

to natural river processes and characteristics associated with Alternative B implementation in the Extended Study Area and Secondary Study Area would be minor as compared to Existing Conditions and the No Project/No Action Alternative, and the effects would not be substantial. The cumulative effects of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on fluvial geomorphologic conditions in the Extended Study Area and Secondary Study Area.

Primary Study Area

Fluvial geomorphologic effects in the Primary Study Area along the Sacramento River under Alternative B would be different than under Alternative A due to the increased size of the proposed Sites Reservoir. The amount of alteration to natural river processes and characteristics in the Primary Study Area would be minor as compared to Existing Conditions and the No Project/No Action Alternative, and the effects would not be substantial. The cumulative effects of Alternative B would be similar to those described for Alternative A in the Primary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on fluvial geomorphologic conditions in the Extended Study Area and Secondary Study Area.

35.4.3.3 Alternative C

Extended Study Area and Secondary Study Area

As described in Chapter 8 Fluvial Geomporphology and Riparian Habitat, fluvial geomorphologic effects of implementation of Alternative C would be similar to those described for Alternative A in the Extended Study Area and most of the Secondary Study Area. Fluvial geomorphologic effects in parts of the Secondary Study Area along the Sacramento River under Alternative B would be different than under Alternative A due to the increased size of the proposed Sites Reservoir. However, the amount of alteration to natural river processes and characteristics in the Extended Study Area and Secondary Study Area would be minor as compared to Existing Conditions and the No Project/No Action Alternative, and the effects would not be substantial. The cumulative effects of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on fluvial geomorphologic conditions in the Extended Study Area and Secondary Study Area.

Primary Study Area

Fluvial geomorphologic effects in the Primary Study Area along the Sacramento River under Alternative C would be different than under Alternative A due to the increased size of the proposed Sites Reservoir. The amount of alteration to natural river processes and characteristics in the Primary Study Area would be minor as compared to Existing Conditions and the No Project/No Action Alternative, and the effects would not be substantial. The cumulative effects of Alternative B would be similar to those described for Alternative A in the Primary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on fluvial geomorphologic conditions in the Extended Study Area and Secondary Study Area.

35.4.4 Flood Control and Management

Adverse effects to flood control and management are caused by substantially altering drainage patterns, placement of structures within a 100-year Flood Hazard Area, and/or exposure of people or structures to

substantial risks from flooding. As described in Chapter 9 Flood Control and Management, the No Project/No Action Alternative would result in no effects to flood control and management as compared to Existing Conditions.

Future projects evaluated in the cumulative effects analysis could affect flood management conditions in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area.

35.4.4.1 Alternative A

Extended Study Area and Secondary Study Area

As described in Chapter 9 Flood Control and Management, anticipated changes in CVP and SWP reservoir storage and release operations under Alternative A are not anticipated to reduce flood storage potential or increase river flows during flood events.

Implementation of projects considered under the cumulative effects analysis that could result in changes in CVP and SWP operation (including the SWRCB Bay-Delta Water Quality Plan Update, Bay Delta Conservation Plan, and Shasta Lake Water Resources Investigation) generally are being developed to improve flow regimes in the Sacramento, Feather, American, and San Joaquin rivers and to not increase flood risks on those rivers. Implementation of local water supply, flood management, and ecosystem improvement projects (including Delta Plan, North Delta Flood Control and Ecosystem Restoration Project, and San Joaquin River Restoration Program) are not anticipated to increase flood risks on the major rivers or minor streams except for areas that are to be inundated under the project-specific actions, such as expansion of ecosystem habitat in currently non-inundated lands. Therefore, implementation of Alternative A and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on flood control and management in the Extended Study Area and Secondary Study Area.

Primary Study Area

As described in Chapter 9 Flood Control and Management, construction of facilities under Alternative A are not anticipated to result in substantial effects to flood management due to use of standard design criteria to avoid alteration of drainage patterns or impede or redirect flood flows within a 100-year Flood Hazard Area. Implementation of Alternative A would result in a potentially beneficial effect to areas located downstream of the proposed Sites and Golden Gate dams because future flood flows would be captured in the proposed Sites Reservoir and other proposed storage facilities. Implementation of Alternative A also could be operated to reduce peak flows in the Sacramento River downstream of Colusa by up to 5,900 cfs.

Potential effects from increased exposure to flood risks also are not considered to be substantial because the proposed Sites Reservoir would be designed and constructed pursuant to conservative guidelines and design criteria to prevent failure with multiple lines of defense or design redundancy as required to meet both DWR's Division of Safety of Dams and Reclamation's design standards. Therefore, implementation of Alternative A and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on flood control and management in the Primary Study Area.

35.4.4.2 Alternative B

As described in Chapter 9 Flood Control and Management, flood management effects from implementation of Alternative B would be similar to those described for Alternative A in the Extended Study Area, Secondary Study Area, and Primary Study Area,. Therefore, the cumulative effects of Alternative B would be similar to those described for Alternative A in the Extended Study Area, Secondary Study Area, and Primary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on flood control and management.

35.4.4.3 Alternative C

As described in Chapter 9 Flood Control and Management, flood management effects from implementation of Alternative C would be similar to those described for Alternative A in the Extended Study Area, Secondary Study Area, and Primary Study Area. Therefore, the cumulative effects of Alternative C would be similar to those described for Alternative A in the Extended Study Area, Secondary Study Area, and Primary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on flood control and management.

35.4.5 Groundwater Resources

Adverse effects to groundwater resources are caused by depletion of groundwater supplies or increased groundwater elevations that are incompatible with neighboring land uses. As described in Chapter 10 Groundwater Resources, the No Project/No Action Alternative would result in no effects to groundwater resources as compared to Existing Conditions.

Future projects evaluated in the cumulative effects analysis could affect groundwater resources in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area.

35.4.5.1 Alternative A

Extended Study Area and Secondary Study Area

As described in Chapter 10 Groundwater Resources, improved CVP and SWP water supply reliability in the Extended Study Area could result in reduced use of groundwater in those areas, or additional groundwater recharge. These conditions would not result in substantial effects as compared to Existing Conditions or the No Project/No Action Alternative. Changes in flow regimes in the Secondary Study Area rivers under Alternative A are not expected to substantially affect groundwater recharge in areas adjacent to the rivers and streams and therefore would not result in substantial effects as compared to Existing Conditions and the No Project/No Action Alternative.

Implementation of projects considered under the cumulative effects analysis that could result in changes in CVP and SWP operation (including the SWRCB Bay-Delta Water Quality Plan Update, Bay Delta Conservation Plan, NMFS recovery plan for salmonids, USFWS recovery plan of delta smelt, and Shasta Lake Water Resources Investigation) generally are being developed to either provide increased water supply reliability of historic water deliveries or increase water supply availability. Increased CVP and SWP water supply availability would result in reduced use of groundwater in those areas, or additional

groundwater recharge, and no substantial effects to groundwater levels along streams that convey CVP and SWP water supplies.

Implementation of ecosystem restoration projects also could affect groundwater by raising groundwater levels on adjacent lands. In some cases, the increased groundwater levels could be beneficial. However, if the groundwater levels rose into the root zones of agricultural lands or caused effects to levee and building foundations, the effects could be adverse. Future ecosystem projects considered in the cumulative effects analysis that could contribute to improved recreation resource conditions include the implementation of CVPIA and CALFED objectives; Delta Plan; Regional Advanced Mitigation Program; Semitropic Water Storage District Delta Wetlands; Trinity River Restoration Program; Clear Creek Fisheries Habitat Restoration Program; Deer Creek Irrigation District Dam Fish Passage and Improvement and Flow Enhancement Project; Yolo County Habitat/Natural Community Conservation Plan; Yolo Bypass Wildlife Area Land Management Plan; Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan; Cache Slough Complex Restoration; North Delta Flood Control and Ecosystem Restoration Project; Dutch Slough Tidal Marsh Project; Franks Tract Project; Suisun Marsh Habitat Management, Preservation, and Restoration Plan; and San Joaquin River Restoration Program. Mitigation measures, such as monitoring and installation of groundwater dewatering wells, could reduce the effects. In some cases, the effect could be substantial and unavoidable. For example, the San Joaquin River Restoration Program EIS/EIR identified potential groundwater effects to be substantial and unavoidable in some locations.

Although potentially substantial and unavoidable effects to groundwater resources could occur under future projects, Alternative A would not result in similar effects. Therefore, Alternative A would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on groundwater resources in the Extended Study Area and the Secondary Study Area.

Primary Study Area

As described in Chapter 10 Groundwater Resources, without mitigation, operation of the proposed Holthouse Reservoir Complex, proposed Terminal Regulating Reservoir, and the forebay at the proposed Delevan Pipeline Intake Facilities are anticipated to result in potentially substantial effects due to increased groundwater levels that could adversely affect adjacent agricultural areas. Mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative A and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on groundwater resources.

35.4.5.2 Alternative B

Extended Study Area and Secondary Study Area

As described in Chapter 10 Groundwater Resources, groundwater effects from implementation of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Therefore, the cumulative effects of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on groundwater resources in the Extended Study Area and Secondary Study Area.

Primary Study Area

Groundwater effects in the Primary Study Area under Alternative B would be different than under Alternative A due to the increased size of the proposed Sites Reservoir. Without mitigation, Alternative B could have potentially substantial effects on groundwater resources in the Primary Study Area near the proposed Holthouse Reservoir Complex and proposed Terminal Regulating Reservoir. As described in Chapter 10 Groundwater Resources, mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative B and the future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on groundwater resources.

35.4.5.3 Alternative C

Extended Study Area and Secondary Study Area

As described in Chapter 10 Groundwater Resources, groundwater effects from implementation of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Therefore, the cumulative effects of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on groundwater resources in the Extended Study Area and Secondary Study Area.

Primary Study Area

Groundwater effects in the Primary Study Area under Alternative C would be different than under Alternative A due to the increased size of the proposed Sites Reservoir. Without mitigation, Alternative C could have potentially substantial effects on groundwater resources in the Primary Study Area near the proposed Holthouse Reservoir Complex, proposed Terminal Regulating Reservoir, and the forebay at the proposed Delevan Pipeline Intake Facilities. As described in Chapter 10 Groundwater Resources, mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative C and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on groundwater resources.

35.4.6 Groundwater Quality

Adverse effects to groundwater quality are caused by depletion of groundwater supplies that result in groundwater quality changes or contamination during construction and operation of new facilities. As described in Chapter 11 Groundwater Quality, groundwater quality under the No Project/No Action Alternative would be degraded as compared to Existing Conditions because of continued withdrawals of groundwater or minimal groundwater recharge in areas with groundwater overdraft.

Future projects evaluated in the cumulative effects analysis could affect groundwater quality in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area.

35.4.6.1 Alternative A

Extended Study Area and Secondary Study Area

As described in Chapter 11 Groundwater Quality, improved CVP and SWP water supply reliability in the Extended Study Area could result in improved groundwater quality due to reduced use of groundwater in those areas, or additional groundwater recharge. These conditions would result in a potentially beneficial effect or minimal effects as compared to the Existing Conditions and the No Project/No Action Alternative.

Implementation of projects considered under the cumulative effects assessment that could result in changes in CVP and SWP operation (including the SWRCB Bay-Delta Water Quality Plan Update, Bay Delta Conservation Plan, NMFS recovery plan for salmonids, USFWS recovery plan of delta smelt, and Shasta Lake Water Resources Investigation) generally are being developed to either provide increased water supply reliability of historic water deliveries or increase water supply availability. Increased CVP and SWP water supply availability would result in reduced use of groundwater in those areas or additional groundwater recharge which would improve groundwater quality. Therefore, Alternative A would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on groundwater quality in the Extended Study Area and the Secondary Study Area.

Primary Study Area

Without mitigation, construction and operation activities associated with Alternative A could result in potentially substantial effects from hazardous materials contamination during use of equipment or exposure during excavation. Groundwater contamination also could occur if septic system and well abandonment actions, installation of groundwater dewatering equipment and disposal of withdrawn groundwater, or installation of vault toilets at the proposed recreation facilities are not completed in a manner required by the State and Colusa and Glenn counties to prevent groundwater contamination. As described in Chapter 11 Groundwater Quality, mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative A and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on groundwater quality.

35.4.6.2 Alternative B

Extended Study Area and Secondary Study Area

As described in Chapter 11 Groundwater Quality, groundwater quality effects due to implementation of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Therefore, the cumulative effects of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on groundwater quality in the Extended Study Area and Secondary Study Area.

Primary Study Area

Groundwater quality in the Primary Study Area under Alternative B would be different than under Alternative A due to the increased size of the proposed Sites Reservoir. Without mitigation, Alternative B could have potentially substantial effects on groundwater quality in the Primary Study Area near the proposed Holthouse Reservoir Complex and proposed Terminal Regulating Reservoir. As described in

Chapter 11 Groundwater Quality, mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative B and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on groundwater quality in the Primary Study Area.

35.4.6.3 Alternative C

Extended Study Area and Secondary Study Area

As described in Chapter 11 Groundwater Quality, groundwater quality effects due to implementation of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Therefore, the cumulative effects of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on groundwater quality in the Extended Study Area and Secondary Study Area.

Primary Study Area

Groundwater quality in the Primary Study Area under Alternative C would be different than under Alternative A due to the increased size of the proposed Sites Reservoir. Without mitigation, Alternative C could have potentially substantial effects on groundwater quality in the Primary Study Area near the proposed Holthouse Reservoir Complex, proposed Terminal Regulating Reservoir, and the forebay at the proposed Delevan Pipeline Intake Facilities. As described in Chapter 11 Groundwater Quality, mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative C and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on groundwater quality in the Primary Study Area.

35.4.7 Aquatic Biological Resources

Adverse effects to aquatic biological resources are caused by degraded water quality, habitat modification, interference with fish passage, and predation risk. The No Project/No Action Alternative would not result in substantial effects to aquatic biological resources in most waterbodies as compared to Existing Conditions. As described in Chapter 12 Aquatic Biological Resources, aquatic habitat conditions in the American River would continue to be degraded under the No Project/No Action Alternative as compared to Existing Conditions because of more frequent occurrences of low flows and increased water temperatures that would adversely affect steelhead, green sturgeon, Pacific lamprey, river lamprey, Sacramento splittail, striped bass, and American shad.

Future projects evaluated in the cumulative effects analysis could affect aquatic biological resources in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area.

35.4.7.1 Alternative A

Extended Study Area and Secondary Study Area

As described in Chapter 12 Aquatic Biological Resources, implementation of Alternative A could affect aquatic biological resources. Alternative A was developed to enhance the ability to improve cold water management and Delta water quality, augment Delta outflows, and stabilize flows in the rivers, which in general could result in beneficial effects. However, implementation of Alternative A would reduce the frequency of inundation of the Yolo Bypass as compared to Existing Conditions and the No Project/No Action Alternative. Alternative A also could result in potentially substantial effects to steelhead, green sturgeon, and white sturgeon as compared to both Existing Conditions and the No Project/No Action Alternative, and potentially substantial effects to Sacramento splittail and largemouth bass as compared to the No Project/No Action Alternative. As described in Chapter 12 Aquatic Biological Resources, mitigation measures would reduce the effects.

Implementation of projects considered under the cumulative effects assessment that could result in changes in CVP and SWP operation (including the SWRCB Bay-Delta Water Quality Plan Update, Bay Delta Conservation Plan, NMFS recovery plan for salmonids, USFWS recovery plan of delta smelt, and Shasta Lake Water Resources Investigation) generally are being developed to benefit aquatic biological resources and would not be approved if existing regulatory requirements adopted to protect aquatic biological resources were not incorporated into the future projects. Implementation of ecosystem restoration projects also would enhance aquatic habitat conditions. Future ecosystem projects considered in the cumulative effects analysis that could benefit aquatic biological resources include the implementation of CVPIA and CALFED objectives; Delta Plan; Anadromous Fish Restoration Program; California Aquatic Invasive Species Rapid Response Plan; Regional Advanced Mitigation Program; Butte County Regional Conservation Plan; El Dorado Irrigation District Folsom Lake Temperature Control Device; Lake Natoma Lower American River Temperature Reduction Project; North Bay Aqueduct Alternative Intake; South Delta Temporary Barriers Project; Stockton Deep Water Ship Channel Dissolved Oxygen Project; Trinity River Restoration Program; Clear Creek Fisheries Habitat Restoration Program; Clear Creek Mercury Abatement and Fisheries Restoration Project; Iron Mountain Mine Superfund Site; Mainstem Sacramento River Gravel Augmentation Program; Cottonwood Creek Geomorphological Analysis and Sediment Budget; Mill Creek Riparian Assessment; Deer Creek Irrigation District Dam Fish Passage Improvement and Flow Enhancement Project; Yolo County Habitat/Natural Community Conservation Plan; Yolo Bypass Wildlife Area Land Management Plan; Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan; Cache Slough Complex Restoration; Lower Mokelumne River Spawning Habitat Improvement Project; North Delta Flood Control and Ecosystem Restoration Project; Fish Screen Project at Sherman and Twitchell Islands; Dutch Slough Tidal Marsh Project; Franks Tract Project; Suisun Marsh Habitat Management, Preservation, and Restoration Plan; and San Joaquin River Restoration Program. Implementation of Alternative A and these future projects could result in beneficial effects, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on aquatic biological resources in the Extended Study Area and the Secondary Study Area.

Primary Study Area

Without mitigation, sediment removal activities near the proposed Project intakes and construction of the proposed Delevan Pipeline Intake Facilities could result in potentially substantial effects in the Sacramento River to Central Valley winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley fall-run Chinook salmon, Central Valley late-fall-run Chinook salmon, steelhead,

Pacific lamprey, river lamprey, hardhead, Sacramento-San Joaquin roach, Sacramento splittail, striped bass, American shad, largemouth bass, green sturgeon, and white sturgeon as compared to Existing Conditions and the No Project/No Action Alternative. Construction and sediment removal activities could have potentially substantial effects in waterbodies in the Primary Study Area.

As described in Chapter 12 Aquatic Biological Resources, mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative A and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on aquatic biological resources.

35.4.7.2 Alternative B

Extended Study Area and Secondary Study Area

As described in Chapter 12 Aquatic Biological Resources, the effects of implementation of Alternative B on aquatic biological resources would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Therefore, the cumulative effects of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on aquatic biological resources in the Extended Study Area and Secondary Study Area.

Primary Study Area

The effects of implementation of Alternative B on aquatic biological resources in the Primary Study Area would be different than under Alternative A due to the increased size of the proposed Sites Reservoir. Without mitigation, Alternative B could have potentially substantial effects on aquatic biological resources in waterbodies in the Primary Study Area due to construction and operation effects, and the periodic removal of sediment as compared to Existing Conditions and the No Project/No Action Alternative. As described in Chapter 12 Aquatic Biological Resources, mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative B and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on aquatic biological resources in the Primary Study Area.

35.4.7.3 Alternative C

Extended Study Area and Secondary Study Area

As described in Chapter 12 Aquatic Biological Resources, the effects of implementation of Alternative C on aquatic biological resources would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Therefore, the cumulative effects of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on aquatic biological resources in the Extended Study Area and Secondary Study Area.

Primary Study Area

The effects of implementation of Alternative C on aquatic biological resources in the Primary Study Area would be different than under Alternative A due to the increased size of the proposed Sites Reservoir. Without mitigation, Alternative C could have potentially substantial effects on aquatic biological resources in the Sacramento River and to waterbodies in the Primary Study Area due to construction and operation effects, and the periodic removal of sediment as compared to Existing Conditions and the No Project/No Action Alternative. As described in Chapter 12 Aquatic Biological Resources, mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative C and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on aquatic biological resources in the Primary Study Area.

35.4.8 Botanical Resources

Degradation of botanical resources does exist in the Central Valley when considering past and present conditions. As described in Chapter 13 Botanical Resources, the No Project/No Action Alternative would result in potentially beneficial or minimal effects to botanical resources as compared to Existing Conditions in most locations. However, implementation of the No Project/No Action Alternative would decrease fall flows in the Feather River in dry water years, and late summer and fall flows in the American River in above normal, below normal, and critical dry years as compared to Existing Conditions and would therefore result in potentially substantial effects.

In the Primary Study Area, continued harvest of blue oaks for firewood and other uses under the No Project/No Action Alternative would result in potentially substantial effects to the blue oak woodlands and associated edge habitat.

Several factors associated with future projects evaluated in the cumulative effects analysis could affect botanical resources in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area.

35.4.8.1 Alternative A

Extended Study Area and Secondary Study Area

As described in Chapter 13 Botanical Resources, Alternative A was developed to increase CVP and SWP reservoir storage elevations and stabilize flows in the downstream rivers, which would result in beneficial effects to botanical resources in the Extended Study Area and Secondary Study Area.

Implementation of projects considered under the cumulative effects analysis that could result in changes in CVP and SWP operation (including the SWRCB Bay-Delta Water Quality Plan Update, Bay Delta Conservation Plan, NMFS recovery plan for salmonids, USFWS recovery plan of delta smelt, Butte County Regional Conservation Plan, and Shasta Lake Water Resources Investigation) generally are being developed to improve flow regimes in water bodies, which would benefit riparian habitat. However, the Shasta Lake Water Resources Investigation also could inundate substantial botanical resources along the existing shoreline of Shasta Lake.

Implementation of ecosystem restoration projects also could benefit botanical resources. Future ecosystem restoration projects considered in the cumulative effects analysis that could benefit botanical resources include the implementation of CVPIA and CALFED objectives; Delta Plan; California Aquatic Invasive Species Rapid Response Plan; Regional Advanced Mitigation Program; Semitropic Water Storage District Delta Wetlands; Trinity River Restoration Program; Clear Creek Fisheries Habitat Restoration Program; Cottonwood Creek Non-native Invasive Species Eradication Program; Mill Creek Riparian Assessment; Deer Creek Irrigation District Dam Fish Passage Improvement and Flow Enhancement Project; Yolo County Habitat/Natural Community Conservation Plan; Yolo Bypass Wildlife Area Land Management Plan; Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan; Cache Slough Complex Restoration; North Delta Flood Control and Ecosystem Restoration Project; Dutch Slough Tidal Marsh Project; Franks Tract Project; Solano County Multi-Species Habitat Conservation Plan; Suisun Marsh Habitat Management, Preservation, and Restoration Plan; and San Joaquin River Restoration Program. However, future projects that result in changes or inundation of vegetation could result in substantial effects. Mitigation measures, including preservation and/or restoration of other botanical resources, could reduce the effects. Avoidance of adverse effects is not always feasible. For example, the San Joaquin River Restoration Program EIS/EIR and the Dutch Slough Tidal Marsh Restoration Project EIR identified loss of some botanical resources due to inundation as substantial and unavoidable.

Implementation of Alternative A and these future projects could result in beneficial effects. However, because Alternative A would result in potentially substantial and unavoidable effects in the Primary Study Area (as described below), and some future projects also could result in substantial and unavoidable effects, implementation of Alternative A could result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on botanical resources in the Extended Study Area and the Secondary Study Area.

Primary Study Area

Implementation of Alternative A could have potentially substantial effects on botanical resources in the Primary Study Area due to temporary and permanent loss of vegetation at construction locations. As described in Chapter 13 Botanical Resources, mitigation measures would reduce the effects, with the exception of botanical resources within the inundation area of the proposed Sites Reservoir, and within and adjacent to the inundation area of the proposed Holthouse Reservoir. In these areas, the effects would potentially remain substantial and unavoidable following implementation of mitigation measures. None of the future projects evaluated in the cumulative effects analysis would result in additional construction or additional operation and maintenance activities within the Primary Study Area. However, due to the potentially substantial and unavoidable effects that would occur under Alternative A, implementation of Alternative A could result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on botanical resources in the Primary Study Area.

35.4.8.2 Alternative B

Extended Study Area and Secondary Study Area

As described in Chapter 13 Botanical Resources, effects on botanical resources due to implementation of Alternative B would be similar to those under implementation of Alternative A in the Extended Study Area and Secondary Study Area. The cumulative effects of Alternative B would therefore be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and could result

in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on botanical resources in the Extended Study Area and Secondary Study Area.

Primary Study Area

Effects on botanical resources in the Primary Study Area under Alternative B would be greater than under Alternative A due to the increased size of the proposed Sites Reservoir. Implementation of Alternative B could have potentially substantial effects on botanical resources in the Primary Study Area due to temporary and permanent loss of vegetation at construction locations. As described in Chapter 13 Botanical Resources, mitigation measures would reduce the effects, with the exception of botanical resources within the inundation area of the proposed Sites Reservoir, and within and adjacent to the inundation area of the proposed Holthouse Reservoir. In these areas, the effects would potentially remain substantial and unavoidable following implementation of mitigation measures. None of the future projects evaluated in the cumulative effects analysis would result in additional construction or additional operation and maintenance activities within the Primary Study Area. However, due to the potentially substantial and unavoidable effects that would occur under Alternative B, implementation of Alternative B could result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on botanical resources in the Primary Study Area.

35.4.8.3 Alternative C

Extended Study Area and Secondary Study Area

As described in Chapter 13 Botanical Resources, effects on botanical resources due to implementation of Alternative C would be similar to those under implementation of Alternative A in the Extended Study Area and Secondary Study Area. The cumulative effects of Alternative C would therefore be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and could result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on botanical resources that could exist in the Extended Study Area and Secondary Study Area.

Primary Study Area

Effects on botanical resources in the Primary Study Area under Alternative C would be greater than under Alternative A due to the increased size of the proposed Sites Reservoir. Implementation of Alternative C could have potentially substantial effects on botanical resources in the Primary Study Area due to temporary and permanent loss of vegetation at construction locations. As described in Chapter 13 Botanical Resources, mitigation measures would reduce the effects, with the exception of botanical resources within the inundation area of the proposed Sites Reservoir, and within and adjacent to the inundation area of the proposed Holthouse Reservoir. In these areas, the effects would potentially remain substantial and unavoidable following implementation of mitigation measures. None of the future projects evaluated in the cumulative effects analysis would result in additional construction or additional operation and maintenance activities within the Primary Study Area. However, due to the potentially substantial and unavoidable effects that would occur under Alternative C, implementation of Alternative C could result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on botanical resources in the Primary Study Area.

35.4.9 Terrestrial Biological Resources

Degradation of terrestrial biological resources does exist in the Central Valley when considering past and present conditions. As described in Chapter 14 Terrestrial Biological Resources, the No Project/No

Action Alternative would result in potentially beneficial or minimal effects to terrestrial biological resources as compared to Existing Conditions in most locations. However, implementation of the No Project/No Action Alternative would decrease fall flows in the Feather River in dry water years, and late summer and fall flows in the American River in above normal, below normal, and critical dry years as compared to Existing Conditions, resulting in potentially substantial effects.

In the Primary Study Area, continued cattle grazing in multiple wildlife habitat types and harvest of blue oaks for firewood and other uses under the No Project/No Action Alternative would result in potentially substantial effects to wildlife habitats.

Several factors associated with future projects evaluated in the cumulative effects analysis could affect terrestrial biological resources in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area.

35.4.9.1 Alternative A

Extended Study Area and Secondary Study Area

As described in Chapter 14 Terrestrial Biological Resources, Alternative A was developed to increase CVP and SWP reservoir storage elevations and stabilize flows in the downstream rivers, which would result in beneficial effects to terrestrial biological resources in the Extended Study Area and Secondary Study Area.

Implementation of projects considered under the cumulative effects assessment that could result in changes in CVP and SWP operation (including the SWRCB Bay-Delta Water Quality Plan Update, Bay Delta Conservation Plan, NMFS recovery plan for salmonids, USFWS recovery plan of delta smelt, and Shasta Lake Water Resources Investigation) generally are being developed to improve flow regimes in water bodies, which would benefit riparian habitat.

Implementation of ecosystem restoration projects also would improve wildlife habitat. Future ecosystem projects considered in the cumulative effects analysis that could contribute to improved wildlife habitat include the implementation of CVPIA and CALFED objectives; Delta Plan; California Aquatic Invasive Species Rapid Response Plan; Regional Advanced Mitigation Program; Butte County Regional Conservation Plan; Semitropic Water Storage District Delta Wetlands; Grassland Bypass Project; Trinity River Restoration Program; Clear Creek Fisheries Habitat Restoration Program; Clear Creek Mercury Abatement and Fisheries Restoration Project; Cottonwood Creek Non-native Invasive Species Eradication Program; Mill Creek Riparian Assessment; Deer Creek Irrigation District Dam Fish Passage Improvement and Flow Enhancement Project; Yolo County Habitat/Natural Community Conservation Plan; Yolo Bypass Wildlife Area Land Management Plan; Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan; Cache Slough Complex Restoration; North Delta Flood Control and Ecosystem Restoration Project; Dutch Slough Tidal Marsh Project; Franks Tract Project; Solano County Multi-Species Habitat Conservation Plan; Suisun Marsh Habitat Management, Preservation, and Restoration Plan; and San Joaquin River Restoration Program. However, future projects that result in changes or inundation of habitat could result in substantial effects. Mitigation measures, including preservation and/or restoration of replacement habitat areas, could reduce the effects. Avoidance of adverse effects is not always feasible. For example, the San Joaquin River Restoration Program EIS/EIR and the Dutch Slough Tidal Marsh Restoration Project EIR identified loss of some wildlife habitat due to inundation as substantial and unavoidable.

Implementation of Alternative A and these future projects could result in beneficial effects. However, because Alternative A would result in potentially substantial and unavoidable effects in the Primary Study Area (as described below), Alternative A could result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on terrestrial biological resources in the Extended Study Area and the Secondary Study Area.

Primary Study Area

Implementation of Alternative A could cause potentially substantial effects on terrestrial biological resources in the Primary Study Area due to temporary and permanent loss of habitat at construction locations. As described in Chapter 14 Terrestrial Biological Resources, mitigation measures would reduce the effects, with the exception of the loss of golden eagle foraging habitat due to inundation of the proposed Sites Reservoir. In the proposed reservoir inundation area, the effects to golden eagles would remain substantial and unavoidable following implementation of mitigation measures.

None of the future projects evaluated in the cumulative effects analysis would result in additional construction or additional operation and maintenance activities within the Primary Study Area. However, due to the substantial and unavoidable effects that would occur under Alternative A, implementation of Alternative A would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on terrestrial biological resources.

35.4.9.2 Alternative B

Extended Study Area and Secondary Study Area

As described in Chapter 14 Terrestrial Biological Resources, effects on terrestrial biological resources due to implementation of Alternative B would be similar to those under implementation of Alternative A in the Extended Study Area and Secondary Study Area. The cumulative effects of Alternative B would therefore be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on terrestrial biological resources in the Extended Study Area and Secondary Study Area.

Primary Study Area

Effects on terrestrial biological resources in the Primary Study Area under Alternative B would be greater than under Alternative A due to the increased size of Sites Reservoir. Implementation of Alternative B could cause potentially substantial effects on terrestrial biological resources in the Primary Study Area due to temporary and permanent loss of habitat at construction locations. As described in Chapter 14 Terrestrial Biological Resources, mitigation measures would reduce the effects, with the exception of the loss of golden eagle foraging habitat due to inundation of the proposed Sites Reservoir. In the proposed reservoir inundation area, the effects to golden eagles would remain substantial and unavoidable following implementation of mitigation measures.

None of the future projects evaluated in the cumulative effects analysis would result in additional construction or additional operation and maintenance activities within the Primary Study Area. However, due to the substantial and unavoidable effects that would occur under Alternative B, implementation of Alternative B result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on terrestrial biological resources.

35.4.9.3 Alternative C

Extended Study Area and Secondary Study Area

As described in Chapter 14 Terrestrial Biological Resources, effects on terrestrial biological resources due to implementation of Alternative C would be similar to those under implementation of Alternative A in the Extended Study Area and Secondary Study Area. The cumulative effects of Alternative C would therefore be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on terrestrial biological resources in the Extended Study Area and Secondary Study Area.

Primary Study Area

Effects on terrestrial biological resources in the Primary Study Area under Alternative C would be greater than under Alternative A due to the increased size of the proposed Sites Reservoir. Implementation of Alternative C could cause potentially substantial effects on terrestrial biological resources in the Primary Study Area due to temporary and permanent loss of habitat at construction locations. As described in Chapter 14 Terrestrial Biological Resources, mitigation measures would reduce the effects, with the exception of the loss of golden eagle foraging habitat due to inundation of the proposed Sites Reservoir. In the proposed reservoir inundation area, the effects to golden eagles would remain substantial and unavoidable following implementation of mitigation measures.

None of the future projects evaluated in the cumulative effects analysis would result in additional construction or additional operation and maintenance activities within the Primary Study Area. However, due to the substantial and unavoidable effects that would occur under Alternative C, implementation of Alternative C would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on terrestrial biological resources.

35.4.10 Wetlands and Other Waters of the United States

Degradation of wetlands and other waters of the United States does exist in the Central Valley when considering past and present conditions. As described in Chapter 15 Wetlands and Other Waters of the United States, the No Project/No Action Alternative would result in potentially beneficial or minimal effects to wetlands and other waters as compared to Existing Conditions in most locations. However, implementation of the No Project/No Action Alternative would decrease flows in several rivers in the Secondary Study Area which would result in potentially substantial effects to the waterbodies and associated wetlands. On the Trinity River, decreased flows would occur in March and April in wet years under the No Project/No Action Alternative as compared to Existing Conditions. On the Feather River, decreased flows would occur in November and December in below normal years; August, October, and January through March in dry years; and July, November, and December in critical dry years. On the American River, decreased flows would occur in all months except December, and especially in August, September, and/or October in drier years. Flows in the Sutter Bypass and Yolo Bypass would directly affect wetlands in the bypasses. Flows under the No Project/No Action Alternative would decrease in December in wet, below normal, and dry years, and in November in below normal and dry years, as compared to Existing Conditions. Flows in the Yolo Bypass would decrease in late fall months in dry and below normal years as compared to Existing Conditions. These flow changes would result in potentially substantial effects to wetlands and other waters of the United States.

Several factors associated with future projects evaluated in the cumulative effects analysis could affect wetlands and other waters in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area.

35.4.10.1 Alternative A

Extended Study Area and Secondary Study Area

As described in Chapter 15 Wetlands and Other Waters of the United States, Alternative A was developed to increase CVP and SWP reservoir storage elevations and stabilize flows in the downstream rivers, which would result in beneficial effects in the Extended Study Area and Secondary Study Area.

Implementation of projects considered under the cumulative effects analysis that could result in changes in CVP and SWP operation, surface water flow patterns, and ecosystem restoration (as described above as cumulative projects considered for Surface Water Resources, Fluvial Geomorphology and Riparian Habitat, Aquatic Biological Resources, Botanical Resources, and Terrestrial Biological Resources) generally are being developed to improve flow regimes in water bodies, which would benefit riparian habitat. Implementation of Alternative A and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on wetlands and other waters in the Extended Study Area and the Secondary Study Area.

Primary Study Area

Implementation of Alternative A could cause potentially substantial effects on wetlands and other waters in the Primary Study Area due to temporary and permanent loss of habitat at construction locations. As described in Chapter 15 Wetlands and Other Waters of the United States, mitigation measures would reduce the effects.

None of the future projects evaluated in the cumulative effects analysis would result in additional construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative A and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on wetlands and other waters.

35.4.10.2 Alternative B

Extended Study Area and Secondary Study Area

As described in Chapter 15 Wetlands and Other Waters of the United States, effects on wetlands and other waters due to implementation of Alternative B would be similar to those under implementation of Alternative A in the Extended Study Area and Secondary Study Area. The cumulative effects of Alternative B would therefore be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Implementation of Alternative B and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on wetlands and other waters in the Extended Study Area and the Secondary Study Area.

Primary Study Area

Implementation of Alternative B could cause potentially substantial effects on wetlands and other waters in the Primary Study Area due to temporary and permanent loss of habitat at construction locations. As described in Chapter 15 Wetlands and Other Waters of the United States, mitigation measures would reduce the effects.

None of the future projects evaluated in the cumulative effects analysis would result in additional construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative B and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on wetlands and other waters in the Primary Study Area.

35.4.10.3 Alternative C

Extended Study Area and Secondary Study Area

As described in Chapter 15 Wetlands and Other Waters of the United States, effects on wetlands and other waters due to implementation of Alternative C would be similar to those under implementation of Alternative A in the Extended Study Area and Secondary Study Area. The cumulative effects of Alternative C would therefore be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on wetlands and other waters in the Extended Study Area and Secondary Study Area.

Primary Study Area

Implementation of Alternative C could cause potentially substantial effects on wetlands and other waters in the Primary Study Area due to temporary and permanent loss of habitat at construction locations. As described in Chapter 15 Wetlands and Other Waters of the United States, mitigation measures would reduce the effects.

None of the future projects evaluated in the cumulative effects analysis would result in additional construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative C and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on wetlands and other waters in the Primary Study Area.

35.4.11 Geology, Minerals, Soils, and Paleontology

For the proposed Project, adverse effects to geology and soils are caused by changes in erosion potential and the ability of soils to support use of septic systems with on-site wastewater disposal. Adverse effects to minerals are caused by loss of availability of known mineral resources and increased exposure of people to naturally occurring asbestos. Adverse effects to paleontological resources are caused by potential disturbance during deep excavation.

As described in Chapter 16 Geology, Minerals, Soils, and Paleontology, the No Project/No Action Alternative would result in no effects to geology, soils, minerals, and paleontology as compared to Existing Conditions.

Future projects evaluated in the cumulative effects analysis could result in changes to geological, soil, mineral, and paleontological resources in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area.

35.4.11.1 Alternative A

Extended Study Area and Secondary Study Area

As described in Chapter 16 Geology, Minerals, Soils, and Paleontology, implementation of Alternative A would result in either no effects or minimal effects to geological, soil, mineral, and paleontological resources in the Extended Study Area and Secondary Study Area as compared to Existing Conditions and the No Project/No Action Alternative.

Implementation of projects considered under the cumulative effects assessment could result in changes to geological, soil, mineral, and paleontological resources depending upon the location-specific conditions and construction methods used for each project. Changes could occur during construction of future projects including the Bay Delta Conservation Plan; Anadromous Fish Screen Program; Shasta Lake Water Resources Investigation; Woodland-Davis Water Supply Project; El Dorado Irrigation District Folsom Lake Temperature Control Device; Semitropic Water Storage District Delta Wetlands; North Bay Aqueduct Alternative Intake; Bay Area Regional Desalination Project; Los Vaqueros Reservoir Expansion Phase II; South Delta Temporary Barriers Operations; Upper San Joaquin River Basin Storage Investigation; Grassland Bypass Project; San Luis Reservoir Low Point Improvement Project; Trinity River Restoration Program; Clear Creek Fisheries Habitat Restoration Program; Mainstem Sacramento River Gravel Augmentation Program; Cottonwood Creek Geomorphological Analysis and Sediment Budget; Deer Creek Irrigation District Dam Fish Passage Improvement and Flow Enhancement Project; Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan; Cache Slough Complex Restoration; North Delta Flood Control and Ecosystem Restoration Project; Fish Screen Project at Sherman and Twitchell Islands; Dutch Slough Tidal Marsh Project; Franks Tract Project; Suisun Marsh Habitat Management, Preservation, and Restoration Plan; and San Joaquin River Restoration Program. Mitigation measures would be available to reduce potential effects. In some cases, the effects could remain substantial and unavoidable. For example, soil loss due to erosion at the modified surface water elevation of Shasta Lake and use of aggregate and sand for construction were considered to be substantial and unavoidable effects in the Shasta Lake Water Resources Investigation Preliminary Draft EIS.

Although these projects could result in adverse effects to geological, soil, mineral, and paleontological resources, implementation of Alternative A would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on geological, soils, minerals, and paleontological resources in the Extended Study Area and the Secondary Study Area.

Primary Study Area

Without mitigation, construction and operation of facilities under Alternative A would result in potentially substantial effects due to erosion along the shorelines of the reservoirs and at construction locations; loss of topsoil due to construction activities; placement of some structures on soils with high shrink-swell potential which could adversely affect structural foundations; placement of septic systems on soils with limited ability for on-site wastewater disposal; and deep excavations which could adversely affect paleontological resources. Mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative A and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on geological, soil, mineral, and paleontological resources.

35.4.11.2 Alternative B

Extended Study Area and Secondary Study Area

As described in Chapter 16 Geology, Minerals, Soils, and Paleontology, effects on geological, soil, mineral, and paleontological resources due to implementation of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Therefore, the cumulative effects of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on geological, soil, mineral, and paleontological resources in the Extended Study Area and Secondary Study Area.

Primary Study Area

Effects on geological, soil, mineral, and paleontological resources in the Primary Study Area under Alternative B would be different than under Alternative A due to the increased size of the proposed Sites Reservoir. Without mitigation, Alternative B could cause potentially substantial effects on geological, soil, and paleontological resources in the Primary Study Area. As described in Chapter 16 Geology, Minerals, Soils, and Paleontology, mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative B and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on geological, soil, mineral, and paleontological resources in the Primary Study Area.

35.4.11.3 Alternative C

Extended Study Area and Secondary Study Area

As described in Chapter 16 Geology, Minerals, Soils, and Paleontology, effects on geological, soil, mineral, and paleontological resources due to implementation of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Therefore, the cumulative effects of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on geological, soil, mineral, and paleontological resources in the Extended Study Area and Secondary Study Area.

Primary Study Area

Effects on geological, soil, mineral, and paleontological resources in the Primary Study Area under Alternative C would be different than under Alternative A due to the increased size of the proposed Sites Reservoir. Without mitigation, Alternative C could cause potentially substantial effects on geological, soil, and paleontological resources in the Primary Study Area. As described in Chapter 16 Geology, Minerals, Soils, and Paleontology, mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative C and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on geological, soil, mineral, and paleontological resources in the Primary Study Area.

35.4.12 Faults and Seismicity

For the proposed Project, risks associated with faults and seismicity are related to exposure of people or structures to risks during and after a seismic event and associated with liquefaction or landslides; inundation by seiches or tsunamis; and increase risk due to reservoir-induced seismic events. As described in Chapter 17 Faults and Seismicity, risks associated with faults and seismicity under the No Project/No Action Alternative would be comparable to Existing Conditions.

Future projects evaluated in the cumulative effects analysis could result in increased risks due to liquefaction or landslides near future construction locations in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area.

35.4.12.1 Alternative A

Extended Study Area and Secondary Study Area

As described in Chapter 17 Faults and Seismicity, implementation of Alternative A would result in either no effects or minimal effects related to risks from faults and seismicity in the Extended Study Area and Secondary Study Area as compared to Existing Conditions and the No Project/No Action Alternative.

Implementation of future projects considered under the cumulative effects assessment could result in risks from faults and seismicity depending upon the location-specific conditions and construction methods used for each project. Changes could occur during construction of future projects including the Bay Delta Conservation Plan; Anadromous Fish Screen Program; Shasta Lake Water Resources Investigation; Woodland-Davis Water Supply Project; El Dorado Irrigation District Folsom Lake Temperature Control Device; Semitropic Water Storage District Delta Wetlands; North Bay Aqueduct Alternative Intake; Bay Area Regional Desalination Project; Los Vaqueros Reservoir Expansion Phase II; South Delta Temporary Barriers Operations; Upper San Joaquin River Basin Storage Investigation; Grassland Bypass Project; San Luis Reservoir Low Point Improvement Project; Trinity River Restoration Program; Clear Creek Fisheries Habitat Restoration Program; Mainstem Sacramento River Gravel Augmentation Program; Cottonwood Creek Geomorphological Analysis and Sediment Budget; Deer Creek Irrigation District Dam Fish Passage Improvement and Flow Enhancement Project; Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan; Cache Slough Complex Restoration; North Delta Flood Control and Ecosystem Restoration Project; Fish Screen Project at Sherman and Twitchell Islands; Dutch Slough Tidal Marsh Project; Franks Tract Project; Suisun Marsh Habitat Management, Preservation, and Restoration Plan; and San Joaquin River Restoration Program. Mitigation measures would reduce these effects. Therefore, implementation of Alternative A and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effects related to faults and seismicity in the Extended Study Area and the Secondary Study Area.

Primary Study Area

Without mitigation, construction and operation of proposed facilities under Alternative A would result in potentially substantial effects related to seismically-induced localized landslides or liquefaction at construction locations of some proposed Project facilities. Mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative A and these future projects would not result in a cumulatively considerable

incremental contribution to an overall substantial cumulative adverse effect related to faults and seismicity.

35.4.12.2 Alternative B

Extended Study Area and Secondary Study Area

As described in Chapter 17 Faults and Seismicity, effects related to faults and seismicity due to implementation of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Therefore, the cumulative effects of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect related to faults and seismicity in the Extended Study Area and Secondary Study Area.

Primary Study Area

Effects related to faults and seismicity in the Primary Study Area under Alternative B would be similar to effects under Alternative A. Without mitigation, Alternative B could cause potentially substantial effects related to seismically-induced localized landslides or liquefaction at construction sites of some proposed Project facilities in the Primary Study Area. As described in Chapter 17 Faults and Seismicity, mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative B and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect related to seismically-induced localized landslides or liquefaction at construction sites of some proposed Project facilities in the Primary Study Area.

35.4.12.3 Alternative C

Extended Study Area and Secondary Study Area

As described in Chapter 17 Faults and Seismicity, effects related to faults and seismicity due to implementation of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Therefore, the cumulative effects of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect related to faults and seismicity in the Extended Study Area and Secondary Study Area.

Primary Study Area

Effects related to faults and seismicity in the Primary Study Area under Alternative C would be similar to effects under Alternative A. Without mitigation, Alternative C could cause potentially substantial effects related to seismically-induced localized landslides or liquefaction at construction sites of some proposed Project facilities in the Primary Study Area. As described in Chapter 17 Faults and Seismicity, mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative C and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative

adverse effect related to seismically-induced localized landslides or liquefaction at construction sites of some proposed Project facilities in the Primary Study Area.

35.4.13 Cultural Resources

For the proposed Project, adverse effects to cultural resources are caused by substantial changes in the significance of archaeological or historic resources, or disturbance of traditional cultural properties or human remains. Conditions of cultural resources under the No Project/No Action Alternative would be comparable to Existing Conditions, with the exception of San Luis Reservoir. As described in Chapter 18 Cultural Resources, projected fluctuations of surface water elevations at San Luis Reservoir could result in potentially substantial effects under the No Project/No Action Alternative, as compared to Existing Conditions, because complete assessment of the effects of water level fluctuations on cultural resources has never been conducted.

Future projects evaluated in the cumulative effects analysis could result in potentially substantial effects to cultural resources due to construction and operation activities in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area.

35.4.13.1 Alternative A

Extended Study Area and Secondary Study Area

As described in Chapter 18 Cultural Resources, implementation of Alternative A would result in potentially substantial effects to cultural resources in the regulating reservoirs of the Extended Study Area because complete assessment of the effects of water level fluctuations on cultural resources has never been conducted. Minimal effects are anticipated under Alternative A in the Secondary Study Area as compared to Existing Conditions and the No Project/No Action Alternative.

Implementation of projects considered under the cumulative effects assessment could result in effects to cultural resources depending upon the location-specific conditions and construction methods used for each project. Changes could occur during construction of future projects including Bay Delta Conservation Plan; Anadromous Fish Screen Program; Shasta Lake Water Resources Investigation; Woodland-Davis Water Supply Project; El Dorado Irrigation District Folsom Lake Temperature Control Device; Semitropic Water Storage District Delta Wetlands; North Bay Aqueduct Alternative Intake; Bay Area Regional Desalination Project; Los Vaqueros Reservoir Expansion Phase II; Upper San Joaquin River Basin Storage Investigation; Grassland Bypass Project; San Luis Reservoir Low Point Improvement Project; Trinity River Restoration Program; Deer Creek Irrigation District Dam Fish Passage Improvement and Flow Enhancement Project; Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan; Cache Slough Complex Restoration; North Delta Flood Control and Ecosystem Restoration Project; Fish Screen Project at Sherman and Twitchell Islands; Dutch Slough Tidal Marsh Project; Franks Tract Project; Suisun Marsh Habitat Management, Preservation, and Restoration Plan; and San Joaquin River Restoration Program. Mitigation measures could reduce these effects; although, in many cases, the effects would remain substantial and unavoidable. For example, effects to cultural and historical resources due to disturbance or inundation were identified as substantial and unavoidable in Shasta Lake Water Resources Investigation Preliminary Draft EIS; Suisun Marsh Habitat Management, Preservation, and Restoration Plan EIS/EIR; North Delta Flood Control and Ecosystem Restoration Project EIR; and Dutch Slough Tidal Marsh Restoration Project EIR. Because it is not possible to predict all future effects to cultural resources within the Extended Study Area and

Secondary Study Area, and because implementation of Alternative A would potentially result in substantial and unavoidable effects in the Primary Study Area (as described below); implementation of Alternative A and these future projects could result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to cultural resources in the Extended Study Area and the Secondary Study Area.

Primary Study Area

As described in Chapter 18 Cultural Resources, without mitigation, construction and operation of the proposed Project facilities under Alternative A would result in potentially substantial effects to cultural resources due to construction and operation activities. Mitigation measures would reduce some of the effects. However, potential effects to historic resources and traditional cultural properties could remain substantial and unavoidable.

None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. However, because some of the effects could be substantial and unavoidable, implementation of Alternative A would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to cultural resources in the Primary Study Area.

35.4.13.2 Alternative B

Extended Study Area and Secondary Study Area

As described in Chapter 18 Cultural Resources, effects to cultural resources due to implementation of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Therefore, the cumulative effects of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and implementation of Alternative A and these future projects could result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to cultural resources in the Extended Study Area and the Secondary Study Area.

Primary Study Area

As described in Chapter 18 Cultural Resources, effects to cultural resources in the Primary Study Area under Alternative B would be similar to effects under Alternative A. Without mitigation, construction and operation of the proposed Project facilities under Alternative B would result in potentially substantial effects to cultural resources. Mitigation measures would reduce some of the effects. However, potential effects to historic resources and traditional cultural properties could remain substantial and unavoidable. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. However, because some of the effects could be substantial and unavoidable, implementation of Alternative B could result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to cultural resources in the Primary Study Area.

35.4.13.3 Alternative C

Extended Study Area and Secondary Study Area

As described in Chapter 18 Cultural Resources, effects to cultural resources due to implementation of Alternative C would be similar to those described for Alternative A in the Extended Study Area and

Secondary Study Area. Therefore, the cumulative effects of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and implementation of Alternative A and these future projects could result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to cultural resources in the Extended Study Area and the Secondary Study Area.

Primary Study Area

Effects to cultural resources in the Primary Study Area under Alternative C would be similar to effects under Alternative A. As described in Chapter 18 Chapter 18 Cultural Resources, without mitigation construction and operation of the proposed Project facilities under Alternative B would result in potentially substantial effects to cultural resources. Mitigation measures would reduce some of the effects. However, potential effects to historic resources and traditional cultural properties could remain substantial and unavoidable. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. However, because some of the effects could be substantial and unavoidable, implementation of Alternative C could result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to cultural resources in the Primary Study Area.

35.4.14 Indian Trust Assets

For the proposed Project, adverse effects to an Indian Trust Asset (ITA) are caused by direct changes to the ITA conditions or indirect changes to current activities within an ITA. As described in Chapter 19 Indian Trust Assets, there would be no effects under the No Project/No Action Alternative as compared to Existing Conditions in the Extended Study Area, Secondary Study Area, or Primary Study Area because there are no ITAs within the vicinities of these study areas.

Future projects evaluated in the cumulative effects analysis generally are not located in the vicinity of ITAs.

35.4.14.1 Alternative A

As described in Chapter 19 Indian Trust Assets, implementation of Alternative A would result in no effects as compared to the No Project/No Action Alternative in the Extended Study Area, Secondary Study Area, or Primary Study Area because there are no ITAs within the vicinities of these study areas. Future projects evaluated in the cumulative effects analysis generally are not located in the vicinity of ITAs. Therefore, implementation of Alternative A and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to ITAs in the Extended Study Area, Secondary Study Area, or Primary Study Area.

35.4.14.2 Alternative B

As described in Chapter 19 Indian Trust Assets, implementation of Alternative B would result in no effects as compared to the No Project/No Action Alternative in the Extended Study Area, Secondary Study Area, or Primary Study Area because there are no ITAs within the vicinities of these study areas. Future projects evaluated in the cumulative effects analysis generally are not located in the vicinity of ITAs. Therefore, implementation of Alternative B and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to ITAs in the Extended Study Area, Secondary Study Area, or Primary Study Area.

35.4.14.3 Alternative C

As described in Chapter 19 Indian Trust Assets, implementation of Alternative C would result in no effects as compared to the No Project/No Action Alternative in the Extended Study Area, Secondary Study Area, or Primary Study Area because there are no ITAs within the vicinities of these study areas. Future projects evaluated in the cumulative effects analysis generally are not located in the vicinity of ITAs. Therefore, implementation of Alternative C and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to ITAs in the Extended Study Area, Secondary Study Area, or Primary Study Area.

35.4.15 Land Use

Changes to land use in the Central Valley occurs as agricultural lands and open space are converted to other uses. Generally, land use conversion is associated with development of municipal and industrial land uses which require changes to existing general plans and land use designations. Land use conversions can result in loss of agricultural lands depending upon the historical land use.

As described in Chapter 20 Land Use, the No Project/No Action Alternative would result in no effects or minimal effects to land uses as compared to Existing Conditions.

Several factors associated with future projects evaluated in the cumulative effects analysis could affect land uses in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in land use conversions within the Primary Study Area.

35.4.15.1 Alternative A

Extended Study Area and Secondary Study Area

As described in Chapter 20 Land Use, Alternative A would not result in substantial changes to land uses in the Extended Study Area and Secondary Study Area because CVP and SWP water deliveries would range from a minor decrease to a slight increase as compared to Existing Conditions, and would increase slightly as compared to the No Project/No Action Alternative. The place of use of this water would remain within the areas designated by the SWRCB for the CVP and SWP water rights. Therefore, no changes in land uses would occur due to changes in CVP and SWP water supply deliveries that would occur under Alternative A as compared to Existing Conditions and the No Project/No Action Alternative.

Implementation of projects considered under the cumulative effects assessment that could result in changes in CVP and SWP operation (including the SWRCB Bay-Delta Water Quality Plan Update, Bay Delta Conservation Plan, NMFS recovery plan for salmonids, USFWS recovery plan of delta smelt, and Shasta Lake Water Resources Investigation) generally would not result in a change in land use for the same reasons that are described above for Alternative A.

Implementation of water supply and ecosystem restoration projects would result in changes in land use. Future projects considered in the cumulative effects analysis that could contribute to changes in land use include the implementation of CVPIA and CALFED objectives; Delta Plan; Regional Advanced Mitigation Program; Central Valley Vision; County of Colusa 2030 General Plan; Butte County Regional Conservation Plan; Semitropic Water Storage District Delta Wetlands Project; North Bay Aqueduct Alternative Intake Project; Los Vaqueros Reservoir Expansion Phase II; Upper San Joaquin River Basin Storage Investigation; Grassland Bypass Project; Trinity River Restoration Program; Clear Creek

Fisheries Habitat Restoration Program; Yolo County Habitat/Natural Community Conservation Plan; Yolo Bypass Wildlife Area Land Management Plan; Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan; Cache Slough Complex Restoration; North Delta Flood Control and Ecosystem Restoration Project; Dutch Slough Tidal Marsh Project; Franks Tract Project; Solano County Multi-Species Habitat Conservation Plan; Suisun Marsh Habitat Management, Preservation, and Restoration Plan; and San Joaquin River Restoration Program. Future projects that result in changes or inundation of vegetation could result in substantial effects. Mitigation measures, including preservation and/or restoration of other agricultural lands and placement of the ecosystem restoration areas to avoid physically dividing communities could reduce the effects. Avoidance of adverse effects is not always feasible. For example, the San Joaquin River Restoration Program EIS/EIR and the Shasta Lake Water Resources Investigation identified changes in some land uses and loss of agricultural lands to be substantial and unavoidable.

Because Alternative A would result in potentially substantial and unavoidable effects in the Primary Study Area (as described below) and some future projects also could result in substantial and unavoidable effects, implementation of Alternative A would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on land uses, including agricultural resources, in the Extended Study Area and the Secondary Study Area.

Primary Study Area

Implementation of Alternative A could cause potentially substantial effects on land uses, especially agricultural resources, in the Primary Study Area due to construction of the proposed Project facilities. As described in Chapter 20 Land Use, mitigation measures would reduce some of the effects, but some conflicts or incompatibilities with existing and designated land uses and existing zoning for agricultural and forest land use, as well as the conversion of lands that have Williamson Act contracts, could remain substantial and unavoidable. In addition, the physical division of the community of Sites caused by inundation of the lands within the proposed Sites Reservoir would result in a substantial and unavoidable effect. None of the future projects evaluated in the cumulative effects analysis would result in additional construction or additional operation and maintenance activities within the Primary Study Area. However, due to the potentially substantial effects that would occur under Alternative A, implementation of Alternative A would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on land uses, including agricultural resources, in the Primary Study Area.

35.4.15.2 Alternative B

Extended Study Area and Secondary Study Area

As described in Chapter 20 Land Use, effects on land uses, including agricultural resources, due to implementation of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. The cumulative effects of Alternative B would therefore be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on land uses, including agricultural resources, in the Extended Study Area and Secondary Study Area.

Primary Study Area

As described in Chapter 20 Land Use, effects on land uses, including agricultural resources, in the Primary Study Area under Alternative B would be similar to those described for Alternative A. Implementation of Alternative B could cause potentially substantial effects on land uses, including agricultural resources, in the Primary Study Area at construction locations. Mitigation measures would reduce some of the effects, but some conflicts or incompatibilities with existing and designated land uses and existing zoning for agricultural and forest land use, as well as the conversion of lands that have Williamson Act contracts, could remain substantial and unavoidable In addition, the physical division of the community of Sites caused by inundation of the lands within the proposed Sites Reservoir would result in a substantial and unavoidable effect. None of the future projects evaluated in the cumulative effects analysis would result in additional construction or operation and maintenance activities within the Primary Study Area. However, due to the potentially substantial effects that would occur under Alternative B, implementation of Alternative B would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on land uses, including agricultural resources, in the Primary Study Area.

35.4.15.3 Alternative C

Extended Study Area and Secondary Study Area

As described in Chapter 20 Land Use, effects on land uses, including agricultural resources, due to implementation of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. The cumulative effects of Alternative C would therefore be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on land uses, including agricultural resources, in the Extended Study Area and Secondary Study Area.

Primary Study Area

Effects on land uses, including agricultural resources, in the Primary Study Area under Alternative C would be similar to those described for Alternative A. Implementation of Alternative C could cause potentially substantial effects on land uses, including agricultural resources, in the Primary Study Area at construction locations. As described in Chapter 20 Land Use, mitigation measures would reduce some of the effects, but some conflicts or incompatibilities with existing and designated land uses and existing zoning for agricultural and forest land use, as well as the conversion of lands that have Williamson Act contracts, could remain substantial and unavoidable. In addition, the physical division of the community of Sites caused by inundation of the lands within the proposed Sites Reservoir would result in a substantial and unavoidable effect. None of the future projects evaluated in the cumulative effects analysis would result in additional construction or operation and maintenance activities within the Primary Study Area. However, due to the potentially substantial effects that would occur under Alternative C, implementation of Alternative C would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on land uses, including agricultural resources, in the Primary Study Area.

35.4.16 Recreation Resources

Recreation resources that could be affected by operation of the proposed Project exist throughout the Extended Study Area and Secondary Study Area. As described in Chapter 21 Recreation Resources, the

No Project/No Action Alternative would result in no effects, potentially beneficial effects, or minimal effects to recreation resources as compared to Existing Conditions in most locations. However, implementation of the No Project/ No Action Alternative could result in changes to the amount of water stored in CVP and SWP reservoirs in the Extended Study Area and Secondary Study Area, which could result in a potentially substantial effect to recreation use levels. If CVP and/or SWP exports decrease, water stored in those reservoirs also may decrease to levels that could reduce the ability to use the reservoir for boating, swimming, and fishing. Surface water elevations in Lake Oroville and Folsom Lake and surface water flows in the American River would be reduced more frequently, which would adversely affect recreational opportunities under the No Project/No Action Alternative as compared to Existing Conditions. These conditions would result in potentially substantial effects under the No Project/No Action Alternative.

Several factors associated with future projects evaluated in the cumulative effects analysis could affect recreation resources in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area.

35.4.16.1 Alternative A

Extended Study Area and Secondary Study Area

As described in Chapter 21 Recreation Resources, Alternative A was developed to increase CVP and SWP reservoir storage elevations and stabilize flows in the downstream rivers, which would result in beneficial effects in most locations in the Extended Study Area and Secondary Study Area as compared to Existing Conditions and the No Project/No Action Alternative. However, Alternative A would result in potentially substantial effects at San Luis Reservoir as compared to the No Project/No Action Alternative due to more frequent occurrence of low water storage elevations that would reduce the availability of the existing campground water intake. Mitigation measures would reduce the effects.

Implementation of projects considered under the cumulative effects assessment that could result in changes in CVP and SWP operation (including the SWRCB Bay-Delta Water Quality Plan Update, Bay Delta Conservation Plan, NMFS recovery plan for salmonids, USFWS recovery plan of delta smelt, and Shasta Lake Water Resources Investigation) could further reduce summer water storage elevations and flows in rivers downstream of the CVP and SWP reservoirs. These changes could result in substantial recreation effects at the reservoirs and streams located downstream of the reservoirs.

Implementation of ecosystem restoration projects could increase recreation opportunities if public access is provided. Future ecosystem projects considered in the cumulative effects analysis that could contribute to improved recreation resource conditions include the implementation of CVPIA and CALFED objectives; Delta Plan; California Aquatic Invasive Species Rapid Response Plan; Regional Advanced Mitigation Program; Central Valley Vision; Butte County Regional Conservation Plan; Semitropic Water Storage District Delta Wetlands; Los Vaqueros Reservoir Expansion Phase II; Trinity River Restoration Program; Clear Creek Fisheries Habitat Restoration Program; Clear Creek Mercury Abatement and Fisheries Restoration Project; Cottonwood Creek Non-Native Invasive Species Eradication Program; Mill Creek Riparian Assessment; Deer Creek Irrigation District Dam Fish Passage Improvement and Flow Enhancement Project; Yolo County Habitat/Natural Community Conservation Plan; Yolo Bypass Wildlife Area Land Management Plan; Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan; Cache Slough Complex Restoration; North Delta Flood Control and Ecosystem Restoration Project; Dutch Slough Tidal Marsh Project; Franks Tract Project; Solano County Multi-

species Habitat Conservation Plan; Suisun Marsh Habitat Management, Preservation, and Restoration Plan; and San Joaquin River Restoration Program. Implementation of Alternative A and these future projects could increase recreational opportunities.

Due to the potential for reductions in reservoir water surface elevations in San Luis Reservoir and downstream flows during summer months on the American River under Alternative A and the potential for reductions under future projects, Alternative A would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on recreation resources in the Extended Study Area and the Secondary Study Area.

Primary Study Area

As described in Chapter 21 Recreation Resources, implementation of Alternative A would result in no or minimal effects on recreation resources in the Primary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Implementation of Alternative A and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to recreation resources in the Primary Study Area.

35.4.16.2 Alternative B

Extended Study Area and Secondary Study Area

Effects on recreation resources due to implementation of Alternative B would be similar to those under implementation of Alternative A in the Extended Study Area and Secondary Study Area. Alternative B would result in potentially substantial effects in San Luis Reservoir as compared to the No Project/No Action Alternative due to more frequent occurrence of low water storage elevations that would reduce the availability of the existing campground water intake. Mitigation measures would reduce the effects. The cumulative effects of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Due to the potential for reductions in reservoir water surface elevations in San Luis Reservoir and downstream flows during summer months on the American River under Alternative B and the potential for reductions under future projects, Alternative B would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on recreation resources in the Extended Study Area and the Secondary Study Area.

Primary Study Area

Effects on recreation resources in the Primary Study Area under Alternative B would be the same as under Alternative A. Therefore, the cumulative effects of Alternative B would be similar to those described for Alternative A, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on recreation resources in the Primary Study Area.

35.4.16.3 Alternative C

Extended Study Area and Secondary Study Area

As described in Chapter 21 Recreation Resources, effects on recreation resources due to implementation of Alternative C would result in potentially substantial effects at San Luis Reservoir as compared to the No Project/No Action Alternative due to more frequent occurrence of low water storage elevations that would reduce the availability of the existing campground water intake and the existing boat ramp. Mitigation measures would reduce the effects. The cumulative effects of Alternative C would be similar

to those described for Alternative A in the Extended Study Area and Secondary Study Area. Due to the potential for future reductions in reservoir water surface elevations in San Luis Reservoir and downstream flows during summer months on the American River under Alternative C and the potential for reductions under future projects, Alternative C would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on recreation resources in the Extended Study Area and the Secondary Study Area.

Primary Study Area

Effects on recreation resources in the Primary Study Area under Alternative C would be the same as under Alternative A. Therefore, the cumulative effects of Alternative C would be similar to those described for Alternative A, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on recreation resources in the Primary Study Area.

35.4.17 Socioeconomics

Adverse effects to socioeconomic conditions are caused by changes in regional economic conditions, including effects on population and housing, effects on local government fiscal conditions, recreation economics, agricultural economics, and municipal and industrial water use economics. As described in Chapter 22 Socioeconomics, the No Project/No Action Alternative would result in no effects to socioeconomic conditions as compared to Existing Conditions.

Future projects evaluated in the cumulative effects analysis could affect socioeconomic conditions in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area.

35.4.17.1 Alternative A

Extended Study Area and Secondary Study Area

As described in Chapter 22 Socioeconomics, under Alternative A, improved CVP and SWP water supply reliability in the Extended Study Area and Secondary Study Area could result in reduced use of groundwater that either could be more expensive to use than CVP and SWP water supplies and/or result in less agricultural production than CVP and SWP water supplies. These conditions would result in minimal effects as compared to Existing Conditions and the No Project/No Action Alternative.

Implementation of projects considered under the cumulative effects assessment that could result in changes in CVP and SWP operation (including the SWRCB Bay-Delta Water Quality Plan Update, Bay Delta Conservation Plan, NMFS recovery plan for salmonids, USFWS recovery plan of delta smelt, and Shasta Lake Water Resources Investigation) generally are being developed to either provide increased water supply reliability of historic water deliveries or increase water supply availability. Increased CVP and SWP water supply availability would result in reduced use of groundwater in those areas which could result in no or minimal effects to socioeconomic conditions as compared to Existing Conditions and the No Project/No Action Alternative.

Implementation of water supply and ecosystem restoration projects also could affect socioeconomic conditions either by reducing agricultural productivity if agricultural lands are converted, or increasing recreation economic activity for visitors at the restoration locations or locations with increased waterfowl and other bird populations that use the restored ecosystem. Future projects considered in the cumulative

effects analysis that could contribute to improved recreation resource conditions include the implementation of CVPIA and CALFED objectives; Delta Plan; California Aquatic Invasive Species Rapid Response Plan; Regional Advanced Mitigation Program; Central Valley Vision; County of Colusa 2030 General Plan; Butte County Regional Conservation Plan; Woodland-Davis Water Supply Project; Semitropic Water Storage District Delta Wetlands; North Bay Aqueduct Alternative Intake; Bay Area Regional Desalination Project; Los Vaqueros Reservoir Expansion Phase II; Upper San Joaquin River Basin Storage Investigation; Grassland Bypass Project; Central Valley RWQCB Irrigated Lands Regulatory Program; CV-SALTS; Trinity River Restoration Program; Clear Creek Fisheries Habitat Restoration Program; Yolo County Habitat/Natural Community Conservation Plan; Yolo Bypass Wildlife Area Land Management Plan; Cache Slough Complex Restoration; Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan; North Delta Flood Control and Ecosystem Restoration Project; Dutch Slough Tidal Marsh Project; Franks Tract Project; Solano County Multi-species Habitat Conservation Plan; Suisun Marsh Habitat Management, Preservation, and Restoration Plan; and San Joaquin River Restoration Program. Mitigation measures, such as avoidance of highly productive agricultural lands for ecosystem restoration could reduce the effects. However, in some cases, the effect could be substantial and unavoidable.

Although potentially substantial and unavoidable effects to socioeconomic conditions could occur under future projects, Alternative A would not result in similar effects. Therefore, Alternative A would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on socioeconomics in the Extended Study Area and the Secondary Study Area.

Primary Study Area

As described in Chapter 22 Socioeconomics, Alternative A would result in increased economic activity due to land acquisition within the Primary Study Area, increases in employment and income during construction and operation of the proposed Project, and increases in recreation expenditures associated with increased recreational opportunities. Alternative A would also result in decreased property tax receipts in Glenn and Colusa counties, but these losses would not result in substantial effects to the regional economy. Implementation of Alternative A would result in substantial loss of prime agricultural land in the Primary Study Area, but compensation to property owners would reduce this effect. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities, or projects that would change economic conditions within the Primary Study Area. Implementation of Alternative A and these future projects therefore would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to socioeconomic conditions in the Primary Study Area.

35.4.17.2 Alternative B

As described in Chapter 22 Socioeconomics, socioeconomic effects of implementation of Alternative B would be similar to those described for Alternative A in the Extended Study Area, Secondary Study Area and Primary Study Area. Therefore, the cumulative effects of Alternative B would be similar to those described for Alternative A in the Extended Study Area, Secondary Study Area and Primary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on socioeconomic conditions in the Extended Study Area, Secondary Study Area and Primary Study Area.

35.4.17.3 Alternative C

As described in Chapter 22 Socioeconomics, socioeconomic effects of implementation of Alternative C would be similar to those described for Alternative A in the Extended Study Area, Secondary Study Area and Primary Study Area. Therefore, the cumulative effects of Alternative C would be similar to those described for Alternative A in the Extended Study Area, Secondary Study Area and Primary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on socioeconomic conditions in the Extended Study Area, Secondary Study Area and Primary Study Area.

35.4.18 Environmental Justice

Disproportional effects on minority or low-income populations are caused by changes in the physical, biological, and human environment. As described in Chapter 23 Environmental Justice, the potential for disproportional effects on minority or low-income populations under the No Project/No Action Alternative would be similar to Existing Conditions and result in no effects.

Future projects evaluated in the cumulative effects analysis could affect minority or low-income populations in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in changes within the Primary Study Area.

35.4.18.1 Alternative A

Extended Study Area and Secondary Study Area

As described in Chapter 23 Environmental Justice, under Alternative A, improved CVP and SWP water supply reliability in the Extended Study Area and Secondary Study Area would result in no effects to minority or low-income populations as compared to Existing Conditions and the No Project/No Action Alternative.

Projects considered under the cumulative effects assessment that could result in changes in CVP and SWP operation include those identified in Table 35-1 for botanical resources, cultural resources, land use, recreation resources, air quality, and visual resources. These projects generally are being developed to either provide increased water supply reliability of historic water deliveries or increase water supply availability. Increased CVP and SWP water supply availability could result in improved socioeconomic conditions which would result in no or minimal effects to minority or low-income populations as compared to Existing Conditions and the No Project/No Action Alternative.

Ecosystem restoration projects generally are not located on or adjacent to lands with communities to avoid future conflicts with re-established wildlife populations. Therefore, implementation of ecosystem restoration projects is anticipated to result in no or minimal effects to minority or low-income populations.

Because Alternative A and the future projects would not result in substantial adverse effects to minority or low-income populations, Alternative A would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to minority or low-income populations in the Extended Study Area and the Secondary Study Area.

Primary Study Area

As described in Chapter 23 Environmental Justice, implementation of Alternative A would result in no or minimal effects on minority or low-income populations in the Primary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities and therefore would not affect minority or low-income populations within the Primary Study Area. Implementation of Alternative A and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to minority or low-income populations in the Primary Study Area.

35.4.18.2 Alternative B

As described in Chapter 23 Environmental Justice, effects of implementation of Alternative B would be similar to those described for Alternative A in the Extended Study Area, Secondary Study Area and Primary Study Area. Therefore, the cumulative effects of Alternative B would be similar to those described for Alternative A in the Extended Study Area, Secondary Study Area and Primary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to minority or low-income populations.

35.4.18.3 Alternative C

As described in Chapter 23 Environmental Justice, effects of implementation of Alternative C would be similar to those described for Alternative A in the Extended Study Area, Secondary Study Area and Primary Study Area. Therefore, the cumulative effects of Alternative C would be similar to those described for Alternative A in the Extended Study Area, Secondary Study Area and Primary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to minority or low-income populations.

35.4.19 Air Quality

For the proposed Project, changes in air quality could occur during construction and operations. During proposed Project construction, vehicle emissions and dust could result in total volume of pollutants that exceed objectives in adopted air quality management plans, exceed criteria in the adopted plans, or result in a cumulatively considerable net increase in nonattainment pollutants. During proposed Project operation, the primary activity that could affect air quality would be power generation.

As described in Chapter 24 Air Quality, air quality under the No Project/No Action Alternative would be similar to Existing Conditions. Therefore, there would be no or minimal effects on air quality under the No Project/No Action Alternative.

Future projects evaluated in the cumulative effects analysis could result in changes to air quality in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area; however, air quality in the Primary Study Area would be influenced by air quality in the Secondary Study Area.

35.4.19.1 Alternative A

Extended Study Area and Secondary Study Area

As described in Chapter 24 Air Quality, implementation of Alternative A would result in either no effects or minimal effects to air quality in the Extended Study Area and Secondary Study Area as compared to Existing Conditions and the No Project/No Action Alternative.

Implementation of projects considered under the cumulative effects assessment could result in changes to air quality depending upon the location-specific conditions and construction methods used for each project. Changes to air quality in the Secondary Study Area could occur during construction of future projects including the Bay Delta Conservation Plan; Anadromous Fish Screen Program; Shasta Lake Water Resources Investigation; Woodland-Davis Water Supply Project; El Dorado Irrigation District Folsom Lake Temperature Control Device; Semitropic Water Storage District Delta Wetlands; North Bay Aqueduct Alternative Intake; Bay Area Regional Desalination Project; Los Vaqueros Reservoir Expansion Phase II; South Delta Temporary Barriers Operations; Upper San Joaquin River Basin Storage Investigation; Grassland Bypass Project; San Luis Reservoir Low Point Improvement Project; Trinity River Restoration Program; Clear Creek Fisheries Habitat Restoration Program; Mainstem Sacramento River Gravel Augmentation Program; Cottonwood Creek Geomorphological Analysis and Sediment Budget; Deer Creek Irrigation District Dam Fish Passage Improvement and Flow Enhancement Project; Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan; Cache Slough Complex Restoration; North Delta Flood Control and Ecosystem Restoration Project; Dutch Slough Tidal Marsh Project; Franks Tract Project; Suisun Marsh Habitat Management, Preservation, and Restoration Plan; and San Joaquin River Restoration Program. Mitigation measures would be available to reduce potential effects. In some cases, the effects could remain substantial and unavoidable. For example, air quality effects that would occur during construction were identified to be substantial and unavoidable for projects evaluated in the Shasta Lake Water Resources Investigation Preliminary Draft EIS, San Joaquin River Restoration Program EIS/EIR, and North Delta Flood Control and Ecosystem Restoration Project.

Because Alternative A would result in potentially substantial and unavoidable effects in the Primary Study Area (as described below) and some future projects also could result in substantial and unavoidable effects, implementation of Alternative A would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on air quality in the Extended Study Area and the Secondary Study Area.

Primary Study Area

Construction and operation of proposed Project facilities under Alternative A would result in potentially substantial effects to air quality. Mitigation measures would reduce the effects during operation. However, effects during construction would remain substantial and unavoidable.

None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area.

Due to the potential for substantial and unavoidable effects during construction under Alternative A and future projects in the Secondary Study Area which could affect air quality in the Primary Study Area, Alternative A would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on air quality in the Primary Study Area.

35.4.19.2 Alternative B

Extended Study Area and Secondary Study Area

As described in Chapter 24 Air Quality, effects on air quality due to implementation of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. The cumulative effects of Alternative B would therefore be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Alternative B would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on air quality in the Extended Study Area and Secondary Study Area.

Primary Study Area

Construction and operation of proposed Project facilities under Alternative B would result in potentially substantial effects to air quality. Mitigation measures would reduce the effects during operation. However, effects during construction would remain substantial and unavoidable. Due to the potential for substantial and unavoidable effects during construction under Alternative B and future projects in the Secondary Study Area which could affect air quality in the Primary Study Area, Alternative B would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on air quality in the Primary Study Area.

35.4.19.3 Alternative C

Extended Study Area and Secondary Study Area

As described in Chapter 24 Air Quality, effects on air quality due to implementation of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. The cumulative effects of Alternative C would therefore be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Alternative C would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on air quality in the Extended Study Area and Secondary Study Area.

Primary Study Area

Construction and operation of proposed Project facilities under Alternative C would result in potentially substantial effects to air quality. Mitigation measures would reduce the effects during operation. However, effects during construction would remain substantial and unavoidable. Due to the potential for substantial and unavoidable effects during construction under Alternative C and future projects in the Secondary Study Area which could affect air quality in the Primary Study Area, Alternative C would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on air quality in the Primary Study Area.

35.4.20 Climate Change and Greenhouse Gas Emissions

For the proposed Project, changes in greenhouse gas emissions (GHG emissions) could occur during construction and operation due to direct GHG emissions or indirect GHG emissions from pumping and power generation. Potential for an increase or reduction in GHG emissions from open water surfaces was not evaluated in detail in Chapter 25 Climate Change and Greenhouse Gas Emissions, due to limited availability of protocol, guidance, and tools for the analysis.

Under the No Project/No Action Alternative, no proposed Project facilities would be constructed or operated, and no direct construction or operations activities with related GHG emissions would occur as

compared to Existing Conditions. As described in Chapter 25 Climate Change and Greenhouse Gas Emissions, there would be no GHG emissions effects under the No Project/No Action Alternative.

Future projects evaluated in the cumulative effects analysis could result in changes to GHG emissions in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities, or other changes within the Primary Study Area that would result in changes in GHG emissions.

35.4.20.1 Alternative A

As described in Chapter 25 Climate Change and Greenhouse Gas Emissions, implementation of Alternative A would result in no effects or minimal effects from direct GHG emissions during construction and operation of the proposed Project. Alternative A also would result in minimal effects from indirect GHG emission caused by electricity generation for operation of SWP facilities because the projected reduction in GHG emissions for SWP facilities also would provide adequate reductions for the portion of the proposed Project that would serve the SWP or its water users.

Operation of facilities under Alternative A would require a small increase in electricity usage to operate the CVP and would consequently reduce supply of GHG-emissions-free electricity available to sell to California electricity users. Because it is unknown which type of power source would be used to substitute for the lost power, these effects would be potentially substantial and unavoidable.

Implementation of projects considered under the cumulative effects assessment could result in changes to GHG emissions depending upon specific energy demands and construction and operation methods for each project. In general, mitigation measures can be implemented to minimize GHG emissions during construction for future projects. However, GHG emissions would increase to meet future increases in electricity demand to support future projects. Increased GHG emissions from power generation could occur during construction of future projects including the Bay Delta Conservation Plan; Shasta Lake Water Resources Investigation; Woodland-Davis Water Supply Project; Semitropic Water Storage District Delta Wetlands; North Bay Aqueduct Alternative Intake; Bay Area Regional Desalination Project; Los Vaqueros Reservoir Expansion Phase II; Upper San Joaquin River Basin Storage Investigation; Grassland Bypass Project; San Luis Reservoir Low Point Improvement Project; Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan; North Delta Flood Control and Ecosystem Restoration Project; Dutch Slough Tidal Marsh Restoration; and San Joaquin River Restoration Program. Operation of future facilities would result in potentially substantial effects to GHG emissions because it is unknown which type of power source would be used to provide the additional electricity for these projects. Therefore, these effects are considered to be substantial and unavoidable.

Because Alternative A would result in potentially substantial and unavoidable effects and some future projects also could result in substantial and unavoidable effects, implementation of Alternative A would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on GHG emissions.

35.4.20.2 Alternative B

As described in Chapter 25 Climate Change and Greenhouse Gas Emissions, effects on GHG emissions due to implementation of Alternative B would be similar to those described for Alternative A. The cumulative effects of Alternative B would therefore be similar to those described for Alternative A, and

would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on GHG emissions.

35.4.20.3 Alternative C

As described in Chapter 25 Climate Change and Greenhouse Gas Emissions, effects on GHG emissions due to implementation of Alternative C would be similar to those described for Alternative A. The cumulative effects of Alternative C would therefore be similar to those described for Alternative A, and would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on GHG emissions.

35.4.21 Navigation, Transportation, and Traffic

For the proposed Project, effects to navigation, transportation, and traffic could occur during construction and operation. Construction activities along the navigation channels and roadways and construction traffic could result in substantial effects. During operation, recreation-related traffic could result in substantial effects.

As described in Chapter 26 Navigation, Transportation, and Traffic, effects to navigation, transportation, and traffic under the No Project/No Action Alternative would be similar to Existing Conditions. Therefore, there would be no effects or minimal effects to navigation, transportation, and traffic under the No Project/No Action Alternative.

Future projects evaluated in the cumulative effects analysis could result in changes to navigation, transportation, and traffic in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area.

35.4.21.1 Alternative A

Extended Study Area and Secondary Study Area

As described in Chapter 26 Navigation, Transportation, and Traffic, implementation of Alternative A would result in either no effects or minimal effects to navigation, transportation, and traffic in the Extended Study Area and Secondary Study Area as compared to Existing Conditions and the No Project/No Action Alternative.

Implementation of projects considered under the cumulative effects assessment could result in changes to transportation and traffic depending upon the location-specific conditions and construction methods used for each project. Changes to transportation and traffic in the Secondary Study Area could occur during construction of future projects including the Bay Delta Conservation Plan; Shasta Lake Water Resources Investigation, Woodland-Davis Water Supply Project; Semitropic Water Storage District Delta Wetlands; North Bay Aqueduct Alternative Intake; Bay Area Regional Desalination Project; Los Vaqueros Reservoir Expansion Phase II; South Delta Temporary Barriers Operations; Upper San Joaquin River Basin Storage Investigation; Grassland Bypass Project, San Luis Reservoir Low Point Improvement Project; North Delta Flood Control and Ecosystem Restoration Project; Fish Screen Project at Sherman and Twitchell Islands; Dutch Slough Tidal Marsh Project; Franks Tract Project; Suisun Marsh Habitat Management, Preservation, and Restoration Plan; and San Joaquin River Restoration Program. Changes to navigation would be limited to local effects on boat traffic during gravel placement or levee construction. Mitigation measures would be available to reduce potential effects.

Because Alternative A and the future projects would not result in substantial adverse effects, Alternative A would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to navigation, transportation, and traffic in the Extended Study Area and the Secondary Study Area.

Primary Study Area

As described in Chapter 26 Navigation, Transportation, and Traffic, implementation of Alternative A would result in minimal effects to navigation in the Primary Study Area, but potentially substantial effects to transportation and traffic during construction due to roadway hazards or road damage due to oversized or overweight construction vehicles. Operation of the proposed recreation areas and the associated recreational traffic would result in potentially substantial effects to traffic during the summer months. Mitigation measures, such as development of a traffic control plan, would reduce the effects during construction and operations.

None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative A and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to navigation, transportation, and traffic in the Primary Study Area.

35.4.21.2 Alternative B

Extended Study Area and Secondary Study Area

As described in Chapter 26 Navigation, Transportation, and Traffic, effects of implementation of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Therefore, the cumulative effects of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to navigation, transportation, and traffic.

Primary Study Area

As described in Chapter 26 Navigation, Transportation, and Traffic, effects of implementation of Alternative B would be similar to those described for Alternative A in the Primary Study Area. Without mitigation, Alternative B could cause potentially substantial effects to transportation and traffic in the Primary Study Area. Mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative B and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to navigation, transportation, and traffic in the Primary Study Area.

35.4.21.3 Alternative C

Extended Study Area and Secondary Study Area

As described in Chapter 26 Navigation, Transportation, and Traffic, effects of implementation of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Therefore, the cumulative effects of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result

in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to navigation, transportation, and traffic.

Primary Study Area

As described in Chapter 26 Navigation, Transportation, and Traffic, effects of implementation of Alternative C would be similar to those described for Alternative A in the Primary Study Area. Without mitigation, Alternative C could cause potentially substantial effects to transportation and traffic in the Primary Study Area. Mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative C and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to navigation, transportation, and traffic in the Primary Study Area.

35.4.22 Noise

For the proposed Project, effects to noise levels could occur during construction. Construction activities near houses and businesses could result in exposure of people to noise or groundborne vibrations.

As described in Chapter 27 Noise, noise levels under the No Project/No Action Alternative would be similar to Existing Conditions. Therefore, there would be no effects or minimal effects to noise levels under the No Project/No Action Alternative.

Future projects evaluated in the cumulative effects analysis could affect noise levels in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area.

35.4.22.1 Alternative A

Extended Study Area and Secondary Study Area

As described in Chapter 27 Noise, implementation of Alternative A would result in no effects or minimal effects to noise levels in the Extended Study Area and Secondary Study Area as compared to Existing Conditions and the No Project/No Action Alternative.

Implementation of projects considered under the cumulative effects assessment could result in changes to noise levels and groundborne vibrations depending upon the location-specific conditions and construction methods used for each project. Changes to noise levels and groundborne vibrations in the Secondary Study Area near houses, businesses, or communities could occur during construction of future projects including the Bay Delta Conservation Plan; Shasta Lake Water Resources Investigation; Woodland-Davis Water Supply Project; El Dorado Irrigation District Folsom Lake Temperature Control Device; Semitropic Water Storage District Delta Wetlands; North Bay Aqueduct Alternative Intake; Bay Area Regional Desalination Project; Los Vaqueros Reservoir Expansion Phase II; South Delta Temporary Barriers Operations; Trinity River Restoration Program; North Delta Flood Control and Ecosystem Restoration Project; Dutch Slough Tidal Marsh Project; Suisun Marsh Habitat Management, Preservation, and Restoration Plan; and San Joaquin River Restoration Program. Mitigation measures would be available to reduce potential effects. However, in some cases, mitigation measures may not be available to reduce the effects. For example, noise levels would remain substantial and unavoidable during portions of the construction activities described in the San Joaquin River Restoration Program EIS/EIR.

Because Alternative A and most future projects would not result in substantial adverse effects, Alternative A would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to noise levels in the Extended Study Area and the Secondary Study Area.

Primary Study Area

As described in Chapter 27 Noise, implementation of Alternative A would result in potentially substantial effects to noise levels during construction near houses, businesses, or communities, including along County Road 69 at the proposed North Road; at the railroad siphon location in Willows; at the Glenn-Colusa Irrigation District Canal headworks; along the proposed Delevan Pipeline corridor; at the proposed Delevan Pipeline Intake Facilities location, at the proposed Terminal Regulating Reservoir location; and near the proposed structure demolition locations. Mitigation measures would reduce the effects.

None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative A and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to noise levels in the Primary Study Area.

35.4.22.2 Alternative B

Extended Study Area and Secondary Study Area

As described in Chapter 27 Noise, effects of implementation of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Therefore, the cumulative effects of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to noise levels in the Extended Study Area and Secondary Study Area.

Primary Study Area

As described in Chapter 27 Noise, effects of implementation of Alternative B would be similar to those described for Alternative A in the Primary Study Area. Without mitigation, Alternative B could cause potentially substantial effects to noise levels in the Primary Study Area. Mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative B and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to noise levels in the Primary Study Area.

35.4.22.3 Alternative C

Extended Study Area and Secondary Study Area

As described in Chapter 27 Noise, effects of implementation of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Therefore, the cumulative effects of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result in a cumulatively considerable incremental

contribution to an overall substantial cumulative adverse effect to noise levels in the Extended Study Area and Secondary Study Area.

Primary Study Area

As described in Chapter 27 Noise, effects of implementation of Alternative C would be similar to those described for Alternative A in the Primary Study Area. Without mitigation, Alternative C could cause potentially substantial effects to noise levels in the Primary Study Area. Mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative C and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to noise levels in the Primary Study Area.

35.4.23 Public Health and Environmental Hazards

For the proposed Project, effects to public health and environmental hazards could occur during construction and operation. Adverse effects to public health and environmental hazards are caused by creation of a public health or environmental health hazard, adverse effects to emergency response plan or evacuation plan, increased risk of wildland fires, and increased risk of exposure to mosquito or vector-borne diseases.

As described in Chapter 28 Public Health and Environmental Hazards, risks to public health and environmental hazards under the No Project/No Action Alternative would be similar to Existing Conditions. Therefore, there would be no effect to public health and environmental hazards under the No Project/No Action Alternative.

Future projects evaluated in the cumulative effects analysis could result in effects to public health and environmental hazards in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area.

35.4.23.1 Alternative A

Extended Study Area and Secondary Study Area

As described in Chapter 28 Public Health and Environmental Hazards, because there would be no direct Project-related construction or maintenance occurring in the Extended Study Area or in most of the Secondary Study Area, there would be no direct or indirect effects on public health related to hazardous materials as compared to Existing Conditions and the No Project/No Action Alternative. During the proposed pump installation at the Red Bluff Pumping Plant in the Secondary Study Area, there could be accidental releases of hazardous materials that would contaminate soil or degrade water quality. Mitigation measures would reduce the effects.

Implementation of projects considered under the cumulative effects assessment could result in changes to public health and environmental hazards due to use or storage of fuels, oils, grease, and lubricants at future project locations. Future projects could that could affect public health and environmental hazards include the Bay Delta Conservation Plan; Anadromous Fish Screen Program; Shasta Lake Water Resources Investigation; Woodland-Davis Water Supply Project; El Dorado Irrigation District Folsom Lake Temperature Control Device; Semitropic Water Storage District Delta Wetlands; North Bay

Aqueduct Alternative Intake; Bay Area Regional Desalination Project; Los Vaqueros Reservoir Expansion Phase II; South Delta Temporary Barriers Operations; Upper San Joaquin River Basin Storage Investigation; Grassland Bypass Project; San Luis Reservoir Low Point Improvement Project; Trinity River Restoration Program; Iron Mountain Mine Superfund Site; Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan; North Delta Flood Control and Ecosystem Restoration Project; Fish Screen Project at Sherman and Twitchell Islands; Dutch Slough Tidal Marsh Project; Franks Tract Project; Suisun Marsh Habitat Management, Preservation, and Restoration Plan; and San Joaquin River Restoration Program. Mitigation measures would be available to reduce potential effects.

Because Alternative A and most future projects would not result in substantial adverse effects, Alternative A would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to public health and environmental hazards in the Extended Study Area and the Secondary Study Area.

Primary Study Area

As described in Chapter 28 Public Health and Environmental Hazards, implementation of Alternative A would result in potentially substantial effects to public health and environmental hazards during construction and operation due to use and storage of fuels, oils, grease, and lubricants, or from the presence of unreported hazardous spills or unlisted underground storage tanks. Potential effects also could occur due to road closure, detour, or traffic congestion during construction that would reduce emergency access or evacuation responses. Operation of the proposed recreation areas under Alternative A would result in increased traffic congestion during the recreation season and an increased need for emergency response or evacuation response providers; increased risk of wildland fire hazards; and increased risk of exposure to insect stings (bees, yellowjackets, and stinging ants), ticks with tick-borne diseases, rodents, flies, Giardia, Swimmer's Itch, liver flukes, rattlesnakes, and poison oak. The presence of surface water in the reservoirs would increase the risk of mosquitoes and vector population and the public health hazard of vector-borne diseases. Mitigation measures would reduce the effects.

None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Implementation of Alternative A and these future projects therefore would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to public health and environmental hazards in the Primary Study Area.

35.4.23.2 Alternative B

Extended Study Area and Secondary Study Area

As described in Chapter 28 Public Health and Environmental Hazards, effects of implementation of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Therefore, the cumulative effects of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to public health and environmental hazards.

Primary Study Area

As described in Chapter 28 Public Health and Environmental Hazards, effects of implementation of Alternative B would be similar to those described for Alternative A in the Primary Study Area. However, the larger size of the proposed Sites Reservoir associated with Alternative B could increase the risk of exposure to mosquitoes and several vectors. Without mitigation, Alternative B could cause potentially substantial effects related to public health and environmental hazards in the Primary Study Area. Mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative B and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to public health and environmental hazards in the Primary Study Area.

35.4.23.3 Alternative C

Extended Study Area and Secondary Study Area

As described in Chapter 28 Public Health and Environmental Hazards, effects of implementation of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Therefore, the cumulative effects of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to public health and environmental hazards.

Primary Study Area

As described in Chapter 28 Public Health and Environmental Hazards, effects of implementation of Alternative C would be similar to those described for Alternative A in the Primary Study Area. However, the larger size of the proposed Sites Reservoir associated with Alternative B could increase the risk of exposure to mosquitoes and several vectors. Without mitigation, Alternative C could cause potentially substantial effects to public health and environmental hazards in the Primary Study Area. Mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative C and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to public health and environmental hazards in the Primary Study Area.

35.4.24 Public Services and Utilities

For the proposed Project, effects to public services and utilities could occur during construction and operation. Adverse effects to public services are caused by an increased demand for emergency response services or increased emergency response time that results in the need for new or physically altered facilities. Adverse effects to utilities are caused by disruption to utilities.

As described in Chapter 29 Public Services and Utilities, effects to public services and utilities under the No Project/No Action Alternative would be similar to Existing Conditions. Therefore, there would be no effect to public services and utilities under the No Project/No Action Alternative.

Future projects evaluated in the cumulative effects analysis could result in effects to public services and utilities in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated

in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area.

35.4.24.1 Alternative A

Extended Study Area and Secondary Study Area

As described in Chapter 29 Public Services and Utilities, implementation of Alternative A would result in no effects or minimal effects to public services and utilities as compared to Existing Conditions and the No Project/No Action Alternative.

Implementation of projects considered under the cumulative effects assessment could result in changes to public services and utilities due to potential disruption to utilities during construction. Future projects that could result in changes to public services and utilities include the Bay Delta Conservation Plan; Shasta Lake Water Resources Investigation; Woodland-Davis Water Supply Project; El Dorado Irrigation District Folsom Lake Temperature Control Device; Semitropic Water Storage District Delta Wetlands; North Bay Aqueduct Alternative Intake; Bay Area Regional Desalination Project; Los Vaqueros Reservoir Expansion Phase II; Upper San Joaquin River Basin Storage Investigation; Grassland Bypass Project; San Luis Reservoir Low Point Improvement Project; Trinity River Restoration Program; North Delta Flood Control and Ecosystem Restoration Project; Dutch Slough Tidal Marsh Project; Suisun Marsh Habitat Management, Preservation, and Restoration Plan; and San Joaquin River Restoration Program. Mitigation measures would be available to reduce potential effects.

Because Alternative A and most future projects would not result in substantial adverse effects, Alternative A would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to public services and utilities in the Extended Study Area and the Secondary Study Area.

Primary Study Area

As described in Chapter 29 Public Services and Utilities, implementation of Alternative A would result in no effects or minimal effects to public services and the need to for new or altered facilities, but would result in potentially substantial effects to utilities during construction. Potential effects during construction could occur if utilities were disrupted during relocation of eight transmission towers from the inundation area of the proposed Holthouse Reservoir, or if any unidentified utilities are disrupted. Mitigation measures would reduce the effects.

None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Implementation of Alternative A and these future projects therefore would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to public services and utilities in the Primary Study Area.

35.4.24.2 Alternative B

Extended Study Area and Secondary Study Area

As described in Chapter 29 Public Services and Utilities, effects of implementation of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Therefore, the cumulative effects of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result in a

cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to public services and utilities in the Extended Study Area and Secondary Study Area.

Primary Study Area

As described in Chapter 29 Public Services and Utilities, effects of implementation of Alternative B would be similar to those described for Alternative A in the Primary Study Area. Without mitigation, Alternative B could cause potentially substantial effects to utilities in the Primary Study Area. Mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative B and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to public services and utilities in the Primary Study Area.

35.4.24.3 Alternative C

Extended Study Area and Secondary Study Area

As described in Chapter 29 Public Services and Utilities, effects of implementation of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Therefore, the cumulative effects of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to public services and utilities in the Extended Study Area and Secondary Study Area.

Primary Study Area

As described in Chapter 29 Public Services and Utilities, effects of implementation of Alternative C would be similar to those described for Alternative A in the Primary Study Area. Without mitigation, Alternative C could cause potentially substantial effects to utilities in the Primary Study Area. Mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative C and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to public services and utilities in the Primary Study Area.

35.4.25 Visual Resources

For the proposed Project, changes in visual resources could occur during construction and operation. During construction, the presence of construction equipment, light and glare from construction lighting and construction vehicles, and disruption of agricultural activities along the valley floor near construction locations would affect visual resources. During operation, light and glare would occur from several sources and changes in the visual landscape would affect visual resources.

As described in Chapter 30 Visual Resources, visual resources under the No Project/No Action Alternative would be similar to Existing Conditions. Therefore, there would be no effects or minimal effects on visual resources under the No Project/No Action Alternative.

Future projects evaluated in the cumulative effects analysis could result in changes to visual resources in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated in the

cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area.

35.4.25.1 Alternative A

Extended Study Area and Secondary Study Area

As described in Chapter 30 Visual Resources, implementation of Alternative A would result in either no effects or minimal effects to visual resources in the Extended Study Area and Secondary Study Area as compared to Existing Conditions and the No Project/No Action Alternative.

Implementation of projects considered under the cumulative effects analysis could result in changes to visual resources depending upon the location-specific conditions and construction methods used for each project. Changes to visual resources in the Secondary Study Area could occur during construction or implementation of future projects including implementation of CVPIA and CALFED objectives; Bay Delta Conservation Plan; Delta Plan; Anadromous Fish Screen Program; Regional Advance Mitigation Program; Central Valley Vision; County of Colusa 2030 General Plan; Butte County Regional Conservation Plan; Shasta Lake Water Resources Investigation; Woodland-Davis Water Supply Project; Semitropic Water Storage District Delta Wetlands; North Bay Aqueduct Alternative Intake; Bay Area Regional Desalination Project; Los Vaqueros Reservoir Expansion Phase II; South Delta Temporary Barriers Operations; Upper San Joaquin River Basin Storage Investigation; Grassland Bypass Project; San Luis Reservoir Low Point Improvement Project; Trinity River Restoration Program; Yolo County Habitat/Natural Community Conservation Plan; Yolo Bypass Wildlife Area Land Management Plan; Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan; Cache Slough Complex Restoration; North Delta Flood Control and Ecosystem Restoration Project; Fish Screen Project at Sherman and Twitchell Islands; Dutch Slough Tidal Marsh Project; Franks Tract Project; Solano County Multi-species Habitat Conservation Plan; Suisun Marsh Habitat Management, Preservation, and Restoration Plan; and San Joaquin River Restoration Program. Mitigation measures generally would be available to reduce potential effects. In some cases, the effects could remain substantial and unavoidable. For example, visual effects were identified to be substantial and unavoidable for projects evaluated in the Shasta Lake Water Resources Investigation Preliminary Draft EIS and the San Joaquin River Restoration Program EIS/EIR.

Because Alternative A would result in potentially substantial and unavoidable effects in the Primary Study Area in the Sacramento Valley floor (as described below) and some future projects also could result in substantial and unavoidable effects, implementation of Alternative A would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on visual resources in the Extended Study Area and the Secondary Study Area.

Primary Study Area

Construction and operation of facilities under Alternative A would result in potentially substantial effects to visual resources. In many cases, mitigation measures would reduce the effects. However, substantial and unavoidable effects would occur due to glare from the water surface of the proposed Sites Reservoir; changes in the visual characteristic of the area from rural and undeveloped to an area with more infrastructure such as the proposed South Bridge and connecting roadways; and change in views across the valley floor due to the six-foot high embankments of the proposed Terminal Regulating Reservoir. The inundation area of the proposed Sites Reservoir would eliminate the large contiguous areas of grazing land that are protected by the goals and objectives of the Colusa County and Glenn County general plans,

resulting in substantial and unavoidable effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area.

Due to the potential for substantial and unavoidable effects under Alternative A and from future projects in the Secondary Study Area which could affect visual resources in or near the Primary Study Area, Alternative A would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on visual resources in the Primary Study Area.

35.4.25.2 Alternative B

Extended Study Area and Secondary Study Area

As described in Chapter 30 Visual Resources, effects on visual resources due to implementation of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. The cumulative effects of Alternative B would therefore be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on visual resources in the Extended Study Area and Secondary Study Area.

Primary Study Area

Construction and operation of proposed Project facilities under Alternative B would result in potentially substantial effects to visual resources, similar to the effects described under Alternative A. However, the extent of the effects due to glare from the water surface of the proposed Sites Reservoir would be greater under Alternative B because the reservoir would be larger than under Alternative A. Mitigation measures would reduce many of the effects. However, substantial and unavoidable effects would occur due to glare from the water surface of the proposed Sites Reservoir; changes in the visual characteristic of the area from rural and undeveloped to an area with more infrastructure such as the proposed South Bridge and connecting roadways; and change in views across the valley floor due to the six-foot high embankments of the proposed Terminal Regulating Reservoir. The inundation area of the proposed Sites Reservoir would eliminate the large contiguous areas of grazing land that are protected by the goals and objectives of the Colusa County and Glenn County general plans, resulting in substantial and unavoidable effects. Due to the potential for substantial and unavoidable effects under Alternative B and from future projects in the Secondary Study Area which could affect visual resources in or near the Primary Study Area, Alternative B would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on visual resources in the Primary Study Area.

35.4.25.3 Alternative C

Extended Study Area and Secondary Study Area

As described in Chapter 30 Visual Resources, effects on visual resources due to implementation of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. The cumulative effects of Alternative C would therefore be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on visual resources in the Extended Study Area and Secondary Study Area.

Primary Study Area

Construction and operation of facilities under Alternative C would result in potentially substantial effects to visual resources, similar to the effects described under Alternative A. However, the extent of the effects due to glare from the water surface of the proposed Sites Reservoir would be greater under Alternative C because the reservoir would be larger than under Alternative A. Mitigation measures would reduce many of the effects. However, substantial and unavoidable effects would occur due to glare from the water surface of the proposed Sites Reservoir; changes in the visual characteristic of the area from rural and undeveloped to an area with more infrastructure, such as the proposed South Bridge and connecting roadways; and change in views across the valley floor due to the six-foot high embankments of the Terminal Regulating Reservoir. The inundation area of the proposed Sites Reservoir would eliminate the large contiguous areas of grazing land that are protected by the goals and objectives of the Colusa County and Glenn County general plans, resulting in substantial and unavoidable effects. Due to the potential for substantial and unavoidable effects under Alternative C and from future projects in the Secondary Study Area which could affect visual resources in or near the Primary Study Area, Alternative C would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on visual resources in the Primary Study Area.

35.4.26 Power Production and Energy

Adverse effects to power production and energy use are caused by wasteful or unnecessary consumption of energy and reduction of the generation of renewable energy. As described in Chapter 31 Power Production and Energy, power production and energy use under the No Project/No Action Alternative would be similar to Existing Conditions and result in no effects.

Future projects evaluated in the cumulative effects analysis could affect power production and energy in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in changes within the Primary Study Area.

35.4.26.1 Alternative A

Extended Study Area and Secondary Study Area

As described in Chapter 31 Power Production and Energy, implementation of Alternative A would not result in wasteful or unnecessary consumption of energy and would not result in reduction of the generation of renewable energy in the Extended Study Area and Secondary Study Area. Implementation of Alternative A would therefore result in no effects or minimal effects as compared to Existing Conditions and the No Project/No Action Alternative.

Implementation of projects considered under the cumulative effects assessment that could result in changes in increased energy use and/or changes in hydropower generation include the SWRCB Bay-Delta Water Quality Plan Update; Bay Delta Conservation Plan; NMFS recovery plan for salmonids; Increased Hydropower Generation Capacity at Lewiston Dam; Shasta Lake Water Resources Investigation; Woodland-Davis Water Supply Project; Semitropic Water Storage District Delta Wetlands; North Bay Aqueduct Alternative Intake; Bay Area Regional Desalination Project; Los Vaqueros Reservoir Expansion Phase II; Upper San Joaquin River Basin Storage Investigation; Grassland Bypass Project; CV-SALTS; San Luis Reservoir Low Point Improvement Project; and San Joaquin River Restoration Program. All of these projects are assumed to be designed to avoid wasteful or unnecessary consumption of energy. Implementation of the Shasta Lake Water Resources Investigation and San Joaquin River Basin Storage Investigation are being developed to avoid reduction in hydropower generation.

Because Alternative A and the future projects would not result in substantial adverse effects, Alternative A would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to power production and energy in the Extended Study Area and the Secondary Study Area.

Primary Study Area

As described in Chapter 31 Power Production and Energy, implementation of Alternative A would result in no effects or minimal effects to power production and energy in the Primary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities, nor would they change c power production and energy within the Primary Study Area. Implementation of Alternative A and these future projects therefore would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to power production and energy in the Primary Study Area.

35.4.26.2 Alternative B

As described in Chapter 31 Power Production and Energy, effects of implementation of Alternative B would be similar to those described for Alternative A in the Extended Study Area, Secondary Study Area and Primary Study Area. Therefore, the cumulative effects of Alternative B would be similar to those described for Alternative A in the Extended Study Area, Secondary Study Area and Primary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on power production and energy in the Extended Study Area, Secondary Study Area and Primary Study Area.

35.4.26.3 Alternative C

As described in Chapter 31 Power Production and Energy, effects of implementation of Alternative C would be similar to those described for Alternative A in the Extended Study Area, Secondary Study Area and Primary Study Area. Therefore, the cumulative effects of Alternative C would be similar to those described for Alternative A in the Extended Study Area, Secondary Study Area and Primary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on power production and energy in the Extended Study Area, Secondary Study Area and Primary Study Area.

35.5 References

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